ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXV, No. 5. CHICAGO, SATURDAY, AUGUST 1, 1914. ISSUED WEEKLY.

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer.

A. A. Gray, General Manager. H. S. Tuthill, Business Manager.

C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor
Chester A. Gauss.....Assistant Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
Holding Back Water-Power Development..... 201
The Convention of the Ohio Electric Light Association.... 202
Standardizing Operating Voltages..... 202
Electrical Development Through Merchandizing..... 203
DEPARTMENTS:
Commercial Practice..... 212
Electric Sign Data..... 215
Electrical Construction..... 216
Public Service Commissions..... 222
New Electrical and Mechanical Appliances..... 237
Current Electrical News..... 242
Record of Electrical Patents..... 247
Electric Vehicle Section..... 249
LEADING ARTICLES:
Electricity in Stone-Cutting Plants..... 207
Crane Wiring.—By George Gorman..... 216
Cost Methods in Electrical Contracting.—By E. M. Raetz. 220
The Indeterminate Franchise or Permit.—By Halford Erickson 224
Ohio Electric Light Association..... 229
The Electric Vehicle..... 249
Electric Vehicle Operation and Maintenance.—By Walter R. Metz 252
The Electric Commercial Vehicle vs. the Horse.—By Charles A. Ward..... 254
BOOK REVIEWS 236
MISCELLANEOUS:
Analysis of American Foreign Trade..... 204
Prominent Lumber Men Meet Tragic Death in Automobile Disaster 204
Ohio Telephone Merger..... 204
Cooking Load in London..... 205
John R. Galloway..... 205
Tornado in Henderson..... 205
Wireless Telegraphy in Japan..... 206
Lighting of the Thames Embankment..... 206
Central-Station Folder for Chinese Laundrymen..... 212
Electrification of Brick Plant..... 213
Floodwood Power to Be Supplied at Low Rates to Athens 214
Employees of Cleveland Central Station Receive Handsome Bonus 214
Pending Sign Legislation in Utah..... 215
Estimating Labor Costs..... 218
E. J. Burns..... 221
Among the Contractors..... 221
Copper Stock and Price Variations..... 223
The Artificial Illumination of Factories..... 227

Copyright, 1914, by the Electrical Review Publishing Company, Inc.

HOLDING BACK WATER-POWER DEVELOPMENT.

The importance of securing early action by Congress on behalf of water-power development was vigorously emphasized last week in a speech before the House of Representatives at Washington by Representative Lonergan of Connecticut, who set forth in no uncertain terms the evils of delaying the proposed Windsor Locks project on the chief river of New England. In advocating the passage of the amended Adamson bill the speaker said that the delay of Congress to authorize the building of a dam across the Connecticut above the Enfield Rapids for hydroelectric power service means that every day the use of 30,000 horsepower is being thrown away beyond recovery; that capital to the amount of five million dollars waiting to develop this enterprise stands checked in its mission; and that a far reaching extension of navigation on the river is held back to the great disadvantage of the cities and towns in the valley between Holyoke and Hartford.

The Windsor Locks case furnishes an excellent illustration of the broader economic benefits of hydroelectric development. It is noteworthy that this substantial power lies within 12 miles of Hartford, in the center of a great manufacturing district, and surrounded by a large tobacco-growing section in need of irrigation. Within the radius of a few miles there are over 100,000 horsepower being developed by the use of coal at an estimated cost which is about double that figured from river utilization. On account of the Enfield Rapids, the river is not navigable above Hartford, but it is no exaggeration to say that practically the entire upper Connecticut Valley is as one in desiring the improvement of the stream so that vessels may dock at Holyoke and extend the benefits of water transportation to Springfield and other populous centers in this region.

The government engineers, after a thorough study, have recommended the improvement of the river for navigation, contingent upon a dam being built by private capital at Windsor Locks. Under the terms of the present General Dam Act it has been impracticable to secure capital for the development of such projects. The real purpose of the present bill and the real solution of the problem is to serve the public interest; to safeguard the people against any overcharges for power; to prevent illegal combinations in restraint of trade; and to encourage the use of resources of great economic value. It is to be hoped that Congress will speedily authorize this development and establish a precedent for conservation

through utilization which will benefit many other parts of the country which are watching the Windsor Locks issue with a view toward opening other local powers to service, once the necessary governmental sanction is postulated.

THE CONVENTION OF THE OHIO ELECTRIC LIGHT ASSOCIATION.

The Ohio Electric Light Association claims the distinction of being the largest state association of central-station men in the country. Its annual convention last week attracted visitors to Cedar Point not only from within the boundaries of the state itself, but from surrounding states, and the high character of its program makes attendance well worth while. In this respect the twentieth annual convention, which is chronicled elsewhere in this issue, was no exception to the general rule and Secretary D. L. Gaskill deserves much credit for the excellent manner in which the convention was planned and carried through.

The registration totaled 408, and while this was not as large as at some of the previous conventions, it was notable that the number of central-station men showed an increase and at this convention they outnumbered the associate members. The abandonment of the usual exhibits perhaps accounted for the falling off in the attendance of the latter. The attendance at the sessions was notably good and the special features which were added to the program this year seemed to meet with general commendation. The weather was what may usually be expected at this season of the year and under the trying conditions the attendance at the sessions showed the marked interest of the members. With Lake Erie close at hand for a plunge following the conclusion of business, however, the weather was not so wearing as it might be in another location.

The change of policy in handling this year's convention seemed to meet with general satisfaction. The program was made up largely of committee reports and special addresses, there being but one paper of the more customary type presented at the convention. Advance printing and distribution of the papers made the reading of reports in full unnecessary and left plenty of time for discussion, which was freely indulged in. There seems to be but one objection to this procedure and that is that many of the members do not read the reports, even when printed well in advance, and are not prepared to discuss the subject without having a report read. The discussion is consequently in danger of wandering off from the subjects brought out in the report. This is a detail which awaits a satisfactory solution and the objection can probably be met by having only a synopsis of the report read at the session, such synopsis calling attention to the principal arguments and recommendations presented in the full report.

The special addresses which were arranged for the convention proved both interesting and instructive and were listened to with close attention. The entertainment features were also greatly enjoyed.

STANDARDIZING OPERATING VOLTAGES.

The constant-potential system of operation for electric lighting plants was inaugurated for use with incandescent lamps. The early incandescent lamps had carbon filaments and the uncertainties of manufacture made it impossible to turn out a product all of which should have the rated candlepower at the same voltage. In rating lamps it is the endeavor of the manufacturer to so rate the lamps of a given class that they will operate at a definite specific consumption, or watts per candle. The rated voltages must consequently vary as much as the variation in the filaments.

On account of this necessity for turning out lamps adapted to different voltages the manufacturers encouraged different central stations to operate at slightly different voltages, thus producing a market for the entire product and making the cost of manufacture, and consequently the selling price of the lamps, less than would be necessary if all lamps which varied from the single standard had to be scrapped. We consequently find different central stations which might be classed as 110-volt plants operating at various voltages between 100 and 125 volts.

With the universal introduction of the tungsten-filament lamp in place of the carbon lamp, and the probability that the latter will soon be entirely superseded, conditions have notably changed. With filaments made from drawn wire great uniformity may be attained and the entire product of a lamp factory may be suited to operation at a single voltage. It is thus evident that the consideration originally inducing the adoption of a variety of voltages no longer exists. In fact, quite the reverse is now the case. The cost of manufacturing, and consequently the selling price of lamps, would be lessened if the entire output of a factory could be rated at a single voltage and no orders need be filled at other voltages.

The question consequently comes up as to whether it is desirable for the central stations to agree upon a single operating voltage and all conform to this The subject came up for considerable discussion at the convention of the Ohio Electric Light Association last week and a committee was appointed to consider the question. It is one which it will be well for central stations everywhere to consider, and decide whether it is feasible to unite upon a single voltage. Some inconvenience would no doubt be experienced during the transition period, and in some cases no doubt a financial loss might be incurred. Unless this would be offset by the reduction in the price of lamps there would of course be no advantage from this standpoint in making a change. There would, however, be an advantage if all heating devices, motors, etc., could be designed for a definite voltage of operation, and always be used at this voltage. For it is only under this condition that the best results can be obtained with electrical apparatus of any kind.

ELECTRICAL DEVELOPMENT THROUGH MERCHANDISING.

New business in the electrical industry means that business which could not be expected to accrue in natural development, but which is created by the sale of new appliances and service and merchandizing methods calculated to stimulate popular interest. This definition, applied to the gas field by Mr. W. F. O'Donnell in an article in *Rollins Magazine* for July on "New Business Methods in the Gas Industry," contains the kernel of the policy of expansion which every live central-station man is striving to realize. From this article, which is one of the most trenchant recently published on merchandizing, many points of electrical sales interest may be extracted. The gas and electrical industries are singularly alike on their merchandizing sides, and it is surprising how mutually adaptable are methods and practices in selling these utilities.

Until about a decade ago, little effort had been made to place the central-station business as a whole on a merchandizing basis. The inquiring citizen could, with some difficulty, find the "electric light plant" and the company office was chiefly known as a dusty lair where bills could be paid and complaints left, with perhaps a few expensive, heavy and rather shopworn appliances tucked away in cupboards or piled up on the floor of the closet of the director's room. The president, like as not, was a highly respected local banker who dropped in every day to exchange Havanas and swap fishing yarns with the superintendent, and once a month at a meeting of the board, accumulated affairs ranging from a new stock issue to the purchase of a horse for the night man's buggy were disposed of in peaceful security. Dividends came and went and with high profits on a small volume of business the company turned the corner of the year with a fair surplus.

Then came the awakening. Threatened competition, agitation of municipal ownership of the street lighting system, dissatisfaction with the treatment of complaints, a feeling that prices might be lower and still yield a reasonable return through a larger gross business, the establishment of a state commission—these and other causes led to the sending out of canvassers for household business on a rather limited scale, followed soon by attempts to capture motor service and to drive out inefficient prime movers of small size from factories and other establishments using power to a small extent. Rates began to go down, but—*mirabile dictu*—gross earnings per capita began to increase, the new-business department was organized and a new era was under way.

The earlier work was not merchandizing. No one regarded an electric light company as a business enterprise, most people regarding it as a combination of plutocrats protected by law for the purpose of separating the people from their money by the aid of the much distrusted meter. With the organization of new-business departments the scenery changed. The companies advertised, rendered better service and humanized themselves. They found that with little effort they could make the people realize that they are agents working for the common good rather than despoilers of the common interest. Sales campaigns were launched and became immensely successful. Manifold uses were devised for electricity and eagerly adopted by the public.

Close examination of the methods of selling electricity used by a few of the more progressive plants in the country led to three fundamental conclusions: first, that the basic principle in the electrical business is no different from that in any other, and that electrical sales can be expanded along merchandizing lines; second, that while the sales of electrical energy are the direct source of profit to the company, yet these can be extended only by the sale of appliances and equipment and keeping them in satisfactory use, hence selling and service should constitute the object toward which the chief efforts should be expended; third, that a business of such great possibilities is worthy of the highest type of salesmanship, therefore electrical salesmen must be educated, paid and selected with a view toward bringing out the highest possible efficiency. As a result, in many cases where mere offices had existed, they were rebuilt or remodeled, so that sometimes in a single city there are several local electrical show rooms, which are in every way equal or superior to other stores in the neighborhood, with a large central store in the heart of the city, so equipped as to window and floor space that it is regarded by shoppers in the same light as other large retail establishments. It was seen that the electrical business should be an all-the-year-around affair, and instead of canvasser-collectors, electrical salesmen were employed working all the year on salaries and commissions, with opportunities to make bonuses of attractive size. Specialists on various industries and classes of appliances were added to central-station organizations, with a force of women demonstrators in many cases.

Electrical merchandizing is no longer a hit-or-miss proposition. Commercial expansion upon a yearly appropriation for advertising, selling and other expenses associated with business development seldom falls short of the estimates of increased electrical and appliance sales, and in many cases far exceeds the returns predicted. The free trial of appliances for a stated period results usually in a very high percentage of sales, and the installment plan of purchasing larger apparatus has accomplished wonders in the electrical as well as in other mercantile fields. Closer attention to service performance, to complaints of dissatisfied customers, personal calls upon apparatus users, readiness to test suspected meters, courtesy in adjustment of bills, relinquishment of deposits, the use of return post-cards sent out for service criticisms, hospitality at the show room and above all, readiness to serve in every possible way have revolutionized conditions within the past ten years. These commercial methods, new to the electrical industry, but tried and true in other lines of business, are making over public opinion in favor of the companies.

Analysis of American Foreign Trade.

Of geat practical value to the American business men seeking information regarding foreign markets for the goods which he handles or the sources of imported raw materials and of goods competing with domestic products are two publications presenting details with respect to every important article exported from, or imported into, the United States, prepared by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

American factories consume great quantities of imported materials, last year's imports including 50 million dollars' worth of fibers, 80 million dollars' worth of raw silk and 100 million dollars' worth each of India rubber and hides. These are mere examples of the more than 500 different classes of articles whose sources are shown in Table 3 of Commerce and Navigation of the United States, and which include such widely varied items as asbestos, beads, camphor, human hair, ivory, kapok, rattans, toys, mushrooms and zinc.

Of even more interest to the American producer is Table 6, exports of merchandise from the United States to each foreign country, from which may be ascertained those parts of the world in which our raw materials, foodstuffs and manufactures are being successfully sold and those yet to be entered. Thus, while the iron and steel industry exports goods to every important country, with sales over 300 million dollars in value per annum, and the automobile industry is making each year a new high record, the cotton-manufacturing industry exports less than 60 million dollars' worth of its products each year, mostly to the non-manufacturing countries of Asia and America.

The distribution abroad of the less conspicuous articles of commerce is also indicated in Table 6. Motion-picture films and cement are typical items chosen at random from the report, which also shows that we export large quantities of dynamos to England, of telephones to Canada, of optical instruments to Germany and France, of stoves and ranges to Kongo and other tropical countries, and of ice to Canada.

The aggregate value of articles imported is shown by Table 3 to have increased from 1,312 million dollars in 1909 to 1,813 million in 1913; while the value of articles exported, as shown by Table 6, has increased from 1,638 million to 2,429 million dollars in the same period. Those desiring to learn the sources of any one of the 500 classes of articles imported or the points of destination of the 500 classes of articles exported may procure the same upon application to the superintendent of documents, Government Printing Office, Washington, D. C., who sells Tables 3 and 6 of Commerce and Navigation of the United States for 1913 at the nominal sums of 30 and 35 cents each, respectively.

Prominent Lumber Men Meet Tragic Death in Automobile Disaster.

James W. Benham, secretary-treasurer of the Naugle Pole & Tie Company, Chicago, Ill., and president of the Northern White Cedar Association, and William B. Bowring, secretary of the C. H. Worcester Lumber Company, Chicago, Ill., were killed, with Mrs. Benham and two others, when the automobile in which they were riding was struck by a fast train on the Chicago & North Western Railway, near Ravinia Park, Ill., on Monday evening, July 27. The automobile was one owned by Mr. Worcester, and the party was organized by Mr. Bowring, who was taking Mr. and Mrs. Benham and some friends to Ravinia Park to attend the operatic performance, "Tales of Hoffman."

Mr. Benham was elected president of the Northern White Cedar Association at its convention early in the year at Escanaba, Mich. His death will be the occasion of sincere regret upon the part of a wide circle of friends and acquaintances. He was highly esteemed among the men of his fraternity, both for his genial personality and his remarkable business ability.

Advance Notice of Next Meeting of the Southwestern Electrical and Gas Association.

At a meeting of the executive committee of the Southwestern Electrical and Gas Association, held at the office of the association at Dallas, Tex., on July 18, it was unanimously decided that the next annual convention of the association will be held in Galveston, Tex., May 19 to 22, 1915. The convention headquarters will be established at the Hotel Galvez. Full information with respect to the convention program may be obtained from the secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

The power house now being built to supply the suburban railways of Melbourne, Australia, which are to be electrified, will furnish 25-cycle, 20,000-volt, three-phase current to 14 substations. At these the current will be converted to 1,500-volt direct current for traction service.

Ohio Telephone Merger.

Following the sanction on July 23 by the State Utilities Commission of the merging of fifteen independent telephone companies under the name of the Ohio State Telephone Company, that concern was incorporated on the same date with a capitalization of $25,000,000. The property of the new company consists of 64 local exchanges in Ohio, including systems in Cleveland, Columbus, Toledo, Dayton, Youngstown and Canton. These six important Ohio cities embrace more than 95,000 stations. In addition the company has long-distance systems utilizing over 30,000 miles of line wire, which serves not only the 64 exchanges, but substantially all the independent properties of the state.

For immediate betterments the sum of $401,831 has been allowed. Of this amount $295,516 is apportioned to Columbus, $55,152 to Washington, $24,190 to London, and $28,973 to Franklin County outside of Columbus.

The merger's whole financial plan was at once declared operative by F. R. Huntington, president of the Huntington National Bank, who had charge of its formation. As authorized by the Commission, the company is to issue not to exceed $5,206,000 common stock, $4,850,000 preferred stock and $5,000,000 series B bonds, the latter to bear 3 per cent the first two years, 4 per cent the third year, and thereafter 5 per cent interest. Of these bonds $3,500,000 are to be sold for not less than 80. Of the proceeds $500,000 are to be used with the stock authorized to retire the stocks and obligations of the constituent companies, and the remaining $2,350,000 is to be spent for improvements and additions. It is required that $400,000 be spent in Cleveland and $100,000 in Cuyahoga County outside of Cleveland. The remaining $1,500,000 bonds are to be issued with the capital stock and $500,000 cash in retiring stocks.

The president of the company is to be Samuel G. McMeen, now president of the Columbus Railway, Power & Light Company; and vice-president of the Clark Management Corporation. Frank A. Davis, formerly president of the United States Telephone Company, and now president of the Scioto Valley Traction Company, will be chairman of the board of directors of the new company. In addition to these two men the directors will be F. R. Huntington, E. R. Sharp, Charles A. Otis, Harry Coulby, F. F. Prentiss, Clarence Brown, William Hardee, George D. Eustis, A. McL. Marshall, H. C. Kiefaber, D. J. Cable, H. B. Peters, and Frank L. Beam, president of the Ohio Independent Telephone Association, Mt. Vernon.

Cooking Load in London.

The Marylebone (London) municipal electricity department, during the past year made excellent progress in heating and cooking and other domestic uses. These account for 8,568 kilowatts of connected load, 4,700 kilowatts of which represents the growth of the last two years. The figure given is made up as follows:

Radiators, 2,903=3,946 kilowatts.
Cooking apparatus, 769=3,001 kilowatts.
Electric irons, 706=238 kilowatts.
Medical appliances, 594=481 kilowatts.
Various, 1,041=989 kilowatts.

The total output for all purposes was 17,038,516 kilowatt-hours, but after meeting all working and financial charges, the net surplus for the year was only $22,000. The consumers number 9,755, and the gross income was $1,093,000.

West Ham, another London municipal system with a total of 34,404,791 units sold and a revenue of $666,000, has a net profit, after meeting all charges, of only $3,700. Here, again, notwithstanding the great difference in the character of the neighborhoods—Marylebone being almost entirely a West End residential district and West Ham a working-class and industrial district—the heating and cooking branch is being boomed well, considering the possibilities. The year's advance is at the rate of 58.3 per cent, from 542 kilowatts to 858 kilowatts. A number of electric kitchens for staff and factory service are equipped and it is in this connection that cooking will go forward rather than for West Ham residences. The units sold for heating and cooking numbered 237,996, an increase of 68.1 per cent. West Ham is also boosting the electric-vehicle charging load. Most of the vehicles handled were charged in bulk with fewer supplies, but so far as can be ascertained about 50,000 units were thus consumed, "a figure," says J. W. Beauchamp, the engineer, "which will perhaps be interesting to refer to in later years."

Robert Montgomery, manager of the commercial department of the Louisville (Ky.) Gas & Electric Company, has arranged for a series of visits to the local industries in Louisville by the members of the new-business force. One plant will be visited each week, the first one being the plant of the Kentucky Wagon Manufacturing Company.

John R. Galloway.

During the great development which has been witnessed in every department of the electrical industry during the past 20 years, no part of the advance made is more significant than that which has come about in the electrical contracting field. In this connection a large measure of credit is due to the enterprising and progressive work accomplished by the officers of the National Electrical Contractors' Association of the United States. This association since its inception has had the support of the leading electrical contractors of the country, and each succeeding administration of its national affairs has been in the hands of men of great executive ability and patriotic motives. For many years one of the most arduous workers of the association, and one who has given to the organization his unstinted personal service, is John R. Galloway, the subject of this sketch.

John R. Galloway,
President of the National Electrical Contractors' Association of the United States.

Mr. Galloway was elected president of the association at its annual convention held recently in Detroit, Mich., after having served for over 12 years in an official connection with the organization, and for the past 11 years as treasurer. His keen appreciation of the duties of this position, and his unfaltering devotion to his post, has caused him to be known as "The Watch-Dog of the Treasury."

Mr. Galloway was born in Baltimore County, Md., October 17, 1852. He was educated in the city of Baltimore, and early in life engaged in the hardware business. In 1875 he located in Washington, D. C., and entered the electrical field. He has grown up with the business, and he looks with pride now on many of the finest buildings in the city of Washington in which he has installed the mechanical and electrical equipment.

Mr. Galloway comes to the presidency of the National Electrical Contractors' Association with an unusual experience in the business and a most intimate acquaintance with the affairs of the association and the ideals for which it stands. His ability is recognized in every department of the industry, and the association is fortunate in securing in Mr. Galloway so worthy a successor as president to the eminent men who have in the preceding years been elevated to this position.

Tornado in Henderson.

Quick recovery under difficulties from storm damage is reported from Henderson, Ky., where three weeks ago a tornado tore through the central part of the city and blew out one end of the municipal electric plant, unroofing the boiler room, fatally injuring an employee and putting the electrical systems of the city out of commission. Before the storm was over Superintendent Hite had got his men together and they went to work at once straightening out the tangle of wires in the storm district and carting the debris out of the boiler room of the plant. Though the walls suffered and the roof took wings the new 200-foot smokestack of the plant was not injured in the least.

Mr. Hite got steam up amid the ruins of the boiler house and before 24 hours had passed was supplying current to light most of the business buildings and residences in the afflicted district. Later in the same evening power was available to enable the street railway company to resume service and shortly the street lighting service was resumed. Mr. Hite estimated the damage to the power plant at about $10,000.

The telephone system of Vienna, the capital of Austria-Hungary, is gradually being converted from manual to semi-automatic working, with the aim of changing eventually to full automatic operation. A development up to 100,000 lines is contemplated.

Wireless Telegraphy in Japan.

In almost every department of Western science and its applications the Japanese have shown that they are not only able to take full advantage of discoveries, but also to adapt and improve them to suit the circumstances of Japan. Wireless telegraphy very soon attracted their attention, and as early as 1886 Dr. Shida, a distinguished graduate of the Imperial College of Engineering, Tokyo, set up an apparatus of his own construction on the banks of the Sumida River, Tokyo, but his attempts to send messages across the water by means of electric waves were not wholly successful. After European scientists began to publish the results of their investigations and experiments, the Japanese electricians turned again to the subject, and this time with considerable success. Dr. Nagaoka and Dr. Mizuno, of the engineering department of the Imperial University, commenced an exhaustive series of experiments with some very encouraging results.

In 1897 Dr. Asano, of the electrical section of the Department of Communications, Tokyo, set up a wireless telegraphic apparatus on the old forts in the Bay of Tokyo, and attempted to exchange messages with a station erected on the reclaimed land at Tsukijima, near the mouth of the Sumida River. Meantime Marconi was making great developments in Europe, and the Japanese electricians learned much from him and other inventors; but they soon developed a system of their own, which is now used in the Department of Communications. This system, known as the "Teishin-sho" system, is claimed to be one of the best systems in use.

As wireless telegraphy was of great importance to the navy, and as it would be a great advantage to have a system different from that used in other navies, the Japanese electricians set to work, and they evolved a special system for use in the Imperial Navy, and it was adopted by the fleet. That system, which is now known as "Kaingun-sho," enables the fleet to preserve absolute secrecy as to position and message. It owes its existence to Professor Kimuna, and was used with telling effect during the war with Russia. It is said that Admiral Togo was able to receive warning of the approach of the Baltic Fleet, and be in readiness to meet it when it came in sight, with the result that is well known, so that it is claimed that in the greatest sea-fight of modern times, Japan owed her victory in a large measure to the perfection of her wireless telegraphy.

To meet the convenience of shipping there are now seven wireless stations in Japan. The stations are so selected that they cover not only Japan proper, but one is in Formosa, and another in Dairen, Manchuria. The wireless system has been largely applied in Japanese merchant ships, nearly all the Japanese transpacific liners being now fully equipped with wireless telegraphic apparatus, and many of the better class of coasting steamers as well.—*Engineering.*

Lanterns Containing 300-Watt Tungsten Lamps on Victoria Embankment.

Lighting of the Thames Embankment, London.

The illumination of Victoria Embankment, the imposing esplanade that follows the contour of the Thames from Westminster to Blackfriars Bridge, is under the control of the London County Council.

The present lighting installation consists of a combination of arc and incandescent units. On the stone wall, which surmounts the retaining wall of the river, are erected ornamental iron standards, the base formed in the design of a dolphin. These standards are about 12 feet in height above the wall, which averages about 3 feet high, and were formerly used for a gas-lighting installation. On each of the posts is mounted a 15-inch globe, embraced in metal bands, the upper half being of opaque and the lower of clear glass on the side toward the street and corrugated glass on the side facing the river. The posts average about 75 feet apart. In each of the lanterns is installed a single 300-watt Osram lamp of the drawn-wire type, the bulk being of clear glass, and spherical. The stem of the lamp is connected to the socket just within a rounded opening in a white convex reflector which fills the circle of the upper half of the ball. The lamp, being about seven inches in diameter, nearly fills the lower half of the globe, its nearness to the base of the ball somewhat impairing the diffusion of light below.

Arc Lamp of 2,000 Candlepower.

These units are connected 9 and 11 in series, and are operated on 200 volts alternating current supplied by private companies.

On the other curb of the sidewalk, at intervals of about 300 feet, are installed 2,000-candlepower arc lamps inclosed in acorn-shaped globes, suspended by goosenecks about 22 feet above the street, the lamps hanging parallel with the sidewalk.

On the opposite side of the street, alternating with the arcs at the street side toward the river, and at equal intervals of 300 feet, is a line of 2,000-candlepower arc units of the same type, with an occasional 3,000-candlepower flaming arc interspersed. These are operated on 50 volts direct current.

Islands or refuges in the center of the wide street and at halting points of the electric tram line that follows the river side of the street, are lighted by clusters of two or three 30-watt Osram lamps in clear-glass lanterns formerly used for gas, on posts set in the center or at the ends of the refuges.

Energy for the system of Embankment illumination is furnished by the Charing Cross Company and the London Electric Light Company.

A hydroelectric power plant for an ultimate development of 8,000 horsepower is being built at Eugenic Falls, Ontario, by the Hydro-Electric Power Commission of Ontario. It will serve the following municipalities: Owen Sound, Markdale, Durham, Flesherton, Chatsworth, Meadford, Thornbury, Walkerton, Chesley, Hanover, and Mount Forest.

Electricity in Stone-Cutting Plants.

The advent of central-station service to stone and marble-cutting plants has resulted in economies that have practically doubled the demand for this material. Data are given herewith on the advantages of electric drive, the horsepower requirements of the various machines used in the industry and on the motor installation of several typical plants using purchased power.

Because of the ease with which sandstone is cut and made ready for use, it is perhaps required in greater quantities for building purposes than any other stone, excepting brick. The great oolitic quarries for which this country is famous are situated near Bedford, Ind., and from these beds great quantities of the stone are taken each year. The principal marble supply is in the New England states with Vermont leading in volume of production.

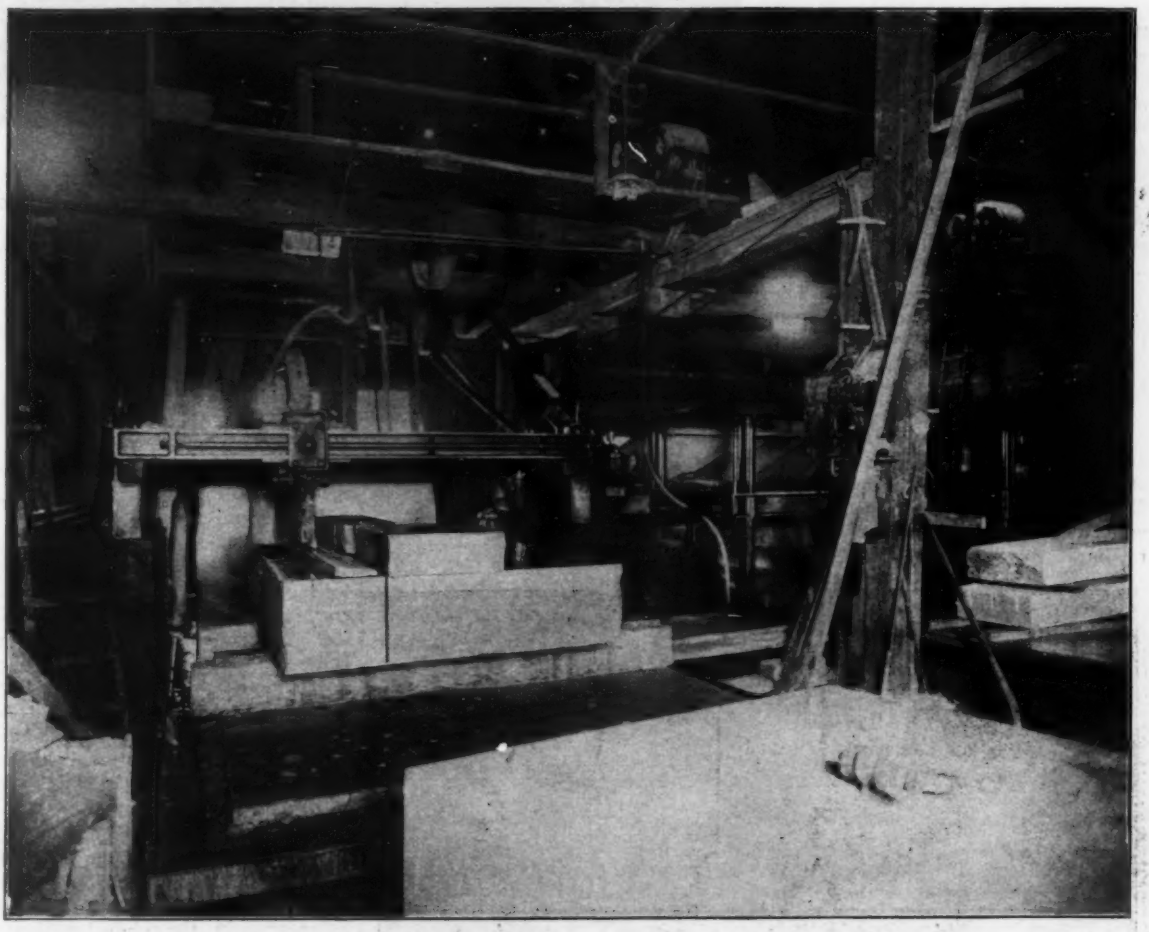
In the stone-cutting industry, as in many others, electricity as a motive power is rapidly displacing the methods of only a few years ago and because of the economies which the advent of central-station power have made possible the total amount of dressed stone and marble used annually in this country has been practically doubled.

Less than 30 years ago almost all cutting was done by hand. Cumbersome and inefficient machinery was used to cut and free the stone from the quarry beds. It was then taken to adjoining yards and roughly cut into blocks of standard sizes, and shipped out to the dealers in all parts of the country. At about this time the brownstone was very popular with city builders, and great quantities were used.

It was not until steam-driven machinery came into general use that any great architectural change appeared, for with machinery there followed a greater variety in stone cutting. For many years steam was the only power employed by the stone cutters; recently, however, it has been superseded by electricity at the quarries, and concurrently the stone cutters and contractors have adopted the latter for their work.

What is true of power development in the sandstone and limestone industries is also true of marble, granite, etc.

The following description of a New England stone-cutting plant, handling marble, particularly, contains data of considerable interest and importance.



Diamond Disk Saw Driven by 15-Horsepower Motor—Olson & Nelson Company, Chicago.

The plant, as originally equipped, consisted of a 100-horsepower Atlas simple slide-value engine belted to a five-inch line shaft with a multitude of countershafts and tight and loose pulleys. Exhaustive tests were conducted by the local central-station company

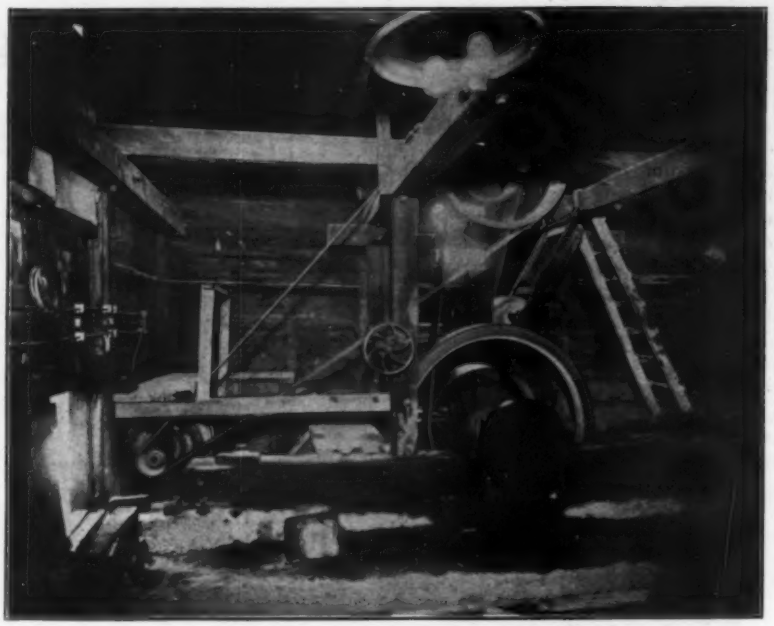
and it was found that 35 horsepower was required to run this shafting with all of the machines idle. The drive was very cumbersome and complicated and, in fact, in certain departments of the plant the multiplicity of shafts and belts made it dangerous to workmen.

Under the old system there was usually considerable trouble in maintaining the speeds of the different machines because of the high starting torque of a number of machines and a great deal of time was lost by belts being thrown off.

There are 30 three-phase 220-volt induction motors installed in the plant as at present equipped, these varying in size from 5 to 20 horsepower.

In preparing stone for the building trades the first operation in which power is used is sawing the blocks into slabs suitable for handling. Gang saws which are used for this work usually consist of rectangular iron frames, about six feet by twelve feet, into which are set on edge in parallel rows flat strips of steel three inches wide, about one-eighth inch thick and about 12 feet long. These strips of steel are used for cutting rough blocks into slabs of any desired thickness. Cutting is due to abrasion, there being no cutting edge on the strips. The saws are stroked back and forth across the marble block about 90 times per minute, while a stream of sand and water is being poured on the work continually.

The number of saws in any frame depends upon the size of the blocks and the thickness of the slabs desired. The small saws contain 10 to 15 blades while as many as 60 blades are used in the largest. One of the accompanying illustrations shows a small gang saw at work cutting a sandstone block. Usually the horizontal travel of the saws is 20 inches and the rate at which they are fed into the block depends upon the stone being cut. This feeding is accomplished by means of a rachet and pawl arrangement.



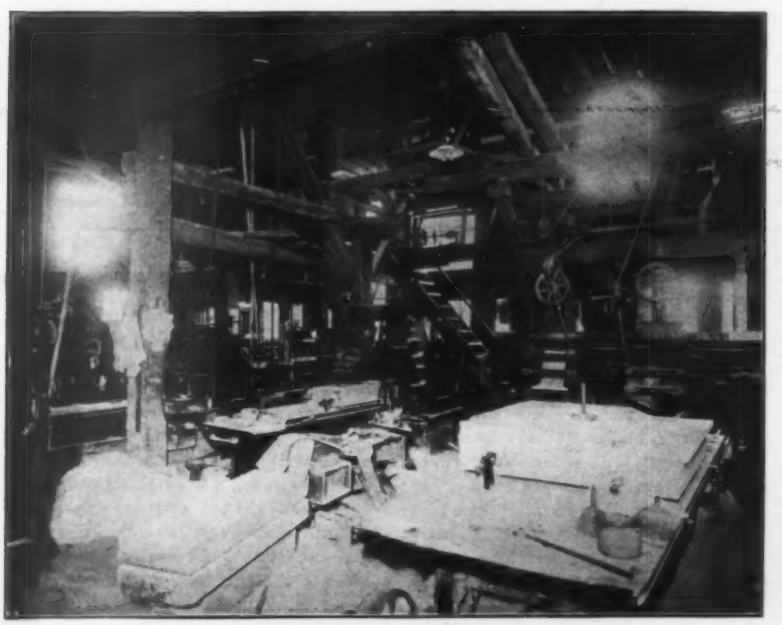
Motor Belted to Gang Saw.

Eight sets of saws are installed in the plant under consideration, six of which are driven by a 7.5-horsepower motor each, the others requiring 10-horsepower motors. A five-foot fly wheel with a very heavy rim is placed on the main drive shaft, this being found necessary in order to obtain a steady speed. When sawing of a block is started, work is continued until the cut is completed, an operation that frequently takes several days and nights when marble is being cut.

From the gang saw the slabs are taken to the rub beds which are used to grind the edges on slabs and blocks of marble down to a true surface. They consist of very heavy cast-iron disks made in sections and varying in diameter from 9 to 14 feet. The disks are 6 to 8 inches in thickness and weigh several tons each.

The equipment in the plant in question comprises six rub beds of the following sizes: Three 11 feet in diameter, one 9 feet in diameter and two 14 feet in diameter. The 11-foot rub beds are each driven by a 10-horsepower motor, the 9-foot by a 7.5-horsepower machine and the two 14-foot rub beds are each driven by a 15-horsepower motor. All motors in this department are of the induction type, three-phase 60 cycles.

Perhaps in no other department of this plant have the advantages of electric motor drive been so forcibly brought to the attention of the management as in the rub-bed section. It has been found that because of the increased speed of the machines from 1,300 to 1,650 feet per minute the output of this department has been increased 33 per cent. Also considerable time is saved in starting as under the old conditions it was necessary to call upon a number of laborers to assist in starting the rub-beds and as this had to be done twice each day, considerable time was consumed, largely because it was necessary to shift the



Group of Motor-Driven Stone Planers.

Stone-Cutting Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Marble-cutting plant doing high grade architectural work. There are 14 men employed, working 10 hours per week. The average output is 10,000 cubic feet of stone per month.

Total connected horsepower, 225. Total number of motors installed, 28. Average kilowatt-hours per month, 18,000.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	14,100	May	18,000	September	18,800
February	16,900	June	18,700	October	17,300
March	18,500	July	19,000	November	13,900
April	19,900	August	16,700	December	10,000

Load-factor, 14 per cent; operating-time load-factor, 30 per cent.

The approximate electrical energy consumed per 100 cubic feet of marble cut and planed is 270 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
3	10	1,120	Each belted to the countershaft of a 11-foot rub bed, running at a speed of 1,650 feet per minute.
1	7.5	1,120	Belted direct to the countershaft of a nine-foot rub bed, 1,650 feet per minute.
2	15	1,120	Each belted direct to the countershaft of a 14-foot rub bed, 1,650 feet per minute.
6	7.5	900	Each geared to the mechanism of a 12-blade gang saw cutting slabs up to 10 feet long.
2	10	900	Each geared to the mechanism of a 14-blade gang saw, cutting slabs up to 12 feet long.
9	5	1,700	Each belted to a steel grinding disk, 20 inches diameter, running at speed of 500 revolutions per minute.
1	15	1,120	Belted to a line shaft driving three stone-cutting lathes; three New Albany planers; one double 10-inch emery wheel; and one small jaw crusher.
1	7.5	1,120	Belted direct to the countershaft of a double planer, takes stone up to 10 feet in length.
1	5	1,120	Geared to a cross-cut saw which consists of a steel strip 4 inches wide by 0.125 inch thick.
1	15	1,120	Belted to a 40-foot line shaft, six hangers, driving one Curtis 8-inch by 8-inch air compressor, 50 to 60 pounds pressure, supplying air to six pneumatic chisels and one surfacer; one American 6-inch by 7-inch air compressor, pressure 50 to 60 pounds; and two flexible arm stone polishers, using a 16-inch steel wheel, a 24-inch emery wheel and an eight-inch canvas wheel for polishing.
1	5	1,120	Belted to a line shaft driving machine-shop equipment comprising one shaper; two drill presses; one high-speed lathe; one milling machine and one 10-inch grindstone.

Stone-cutting plant doing a general cutting and carving business in building stone, granite and marble. There are 14 men employed, working 60 hours per week, mostly on hand cutting.

Total connected horsepower, 82. Total number of motors installed, 7. Average kilowatt-hours per month, 4,500.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	3,200	May	5,300	September	5,100
February	3,300	June	5,800	October	5,200
March	3,500	July	5,300	November	4,000
April	5,200	August	5,100	December	3,500

Load-factor, 10 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts:

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,120	Belted direct to one 12-blade 14-foot gang saw.
1	15	900	Belted to a short line shaft driving two stone lathes; and one 16-inch blower.
1	15	900	Belted direct to one 16-blade gang saw.
1	20	900	Belted direct to one F. R. Patch diamond disk saw.
1	2	1,120	Belted direct to one small diamond disk saw.
1	5	1,120	Belted direct to one Dean-Holyoke triplex pump.
1	15	900	Belted direct to one 16-blade gang saw.

Stone-Cutting Data—Sheet No. 2.

Building stone plant having an average monthly production of 15,000 cubic feet of limestone, cut, planed and carved for building purposes. There are 56 men employed, working 10 hours per day.

Total connected horsepower, 150. Total number of motors installed, 16. Average kilowatt-hours per month, 36,000.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	20,000	May	48,300	September	41,200
February	18,500	June	46,700	October	40,000
March	24,100	July	48,300	November	31,000
April	39,900	August	45,000	December	30,000

Load-factor, 44 per cent.

Operating-time load-factor, 80 per cent.

The approximate electrical energy consumption per cubic foot of stone sawed and planed is 1.53 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. The motors installed at this plant are all of the squirrel-cage induction type with the exception of the crane motors, which are direct current, series wound:

No.	Horse-power.	Speed R. P. M.	Application.
1	75	580	Belted to a 90-foot ten-hanger shaft running at 125 revolutions per minute, driving five 14-foot gang saws, cutting four inches per hour; one 16-foot gang saw, cutting four inches per hour; one Young and Farrell 12-foot diamond rip saw, two-foot stroke, cutting one inch per minute, has two flywheels 6 feet in diameter, speed 63 revolutions per minute. The six gang saws each have a two-foot stroke and an average of six blades each.
1	20	975	Belted to a 42-foot shaft, seven hangers, driving one F. R. Patch double-platen four-head planer, 6 feet by 3.5 by 15 feet; one Lincoln Iron Works four-head planer, 3.5 feet by 3.5 feet by 12 feet.
1	10	1,120	Belted to a short line shaft driving a 13-foot diameter iron rub bed, 35 revolutions per minute.
1	50	850	Belted to an 80-foot shaft, 9 hangers, driving one F. R. Patch double-platen 8-foot by 3.5-foot by 15-foot four-head planer, one Patch open-side two-head planer; one New Albany double-platen four-head planer, 8.5 feet by 3 feet by 15 feet; and one New Albany four-head planer 3.5 feet by 3.5 feet by 15 feet.
2	15	900	Geared to a Meyers six-foot circular saw, 400 revolutions per minute.
2	5	1,150	Drives carriage of above saws.
1	15	900	Belted to a 25-foot shaft, four hangers, driving one F. R. Patch circular planer, 6 feet by 3.5 feet.
2	10	1,350	Each belted to the driving mechanism of a 15-ton boom crane.
1	15	900	Operating a Bedford Foundry & Machine Company 10-ton bridge crane.
1	30	1,150	Operating a New Albany Manufacturing Company 20-ton bridge crane.
1	25	900	Belted direct to an Ingersoll-Rand 10-inch by 10-inch air compressor, 175 cubic feet per minute at 85 pounds pressure. This compressor supplies air to 20 one-half-inch pneumatic hammers and four small drills.
1	15	900	Operating a New Albany Manufacturing Company 10-ton bridge crane.

Marble-cutting plant producing ornamental stone for buildings purposes. There are 6 men employed, working 54 hours per week.

Total connected horsepower, 30. Total number of motors installed, 4. Average kilowatt-hours per month, 4,227.

Kilowatt-hour consumption for 12 months:

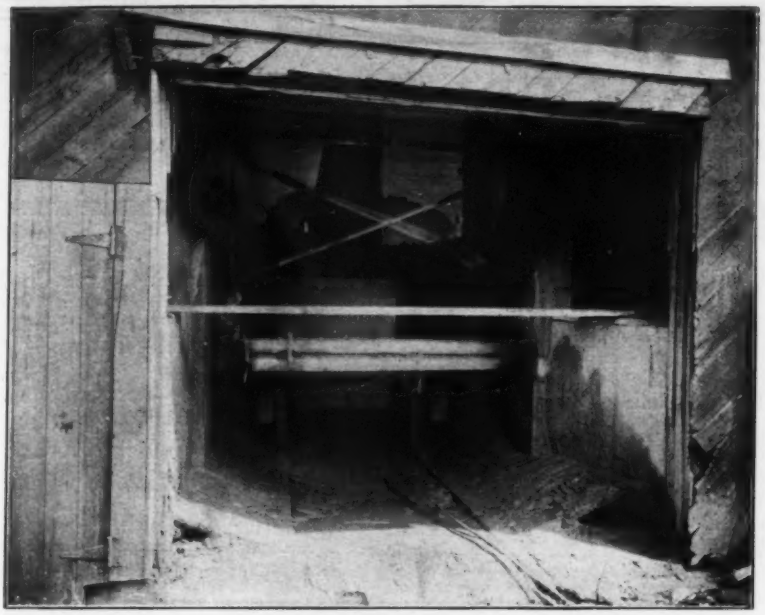
Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	4,450	May	4,800	September	4,500
February	2,300	June	6,610	October	4,480
March	3,430	July	5,290	November	4,300
April	5,060	August	3,790	December	4,000

Load-factor, 26 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors installed are of the squirrel-cage induction type with special frames:

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,200	Belted to a nine-foot five-hanger line shaft driving one 12-blade gang saw, cutting blocks up to 14 feet in length; and one centrifugal pump (does not operate continuously).
1	10	1,800	Belted to a 15-foot line shaft, nine hangers, driving two flexible-arm marble-polishing machines, manufactured by the Lincoln Iron Works One 6 by 6-inch air compressor, manufactured by the Chicago Pneumatic Tool Company.
1	10	1,200	Belted direct to one 12-foot rubbing bed, running at a speed of 1,650 feet per minute.
1	10	1,200	Belted to a 10-foot six-hanger line shaft driving one 12-blade gang saw, cutting blocks up to 12 feet in length; and one small deep-well pump. Considerable of the work at this plant is in the nature of hand carving and cutting.



Gang Saw Cutting Brownstone Block.

belt from the loose to the tight pulley very slowly in order not to break or burn the belt.

From the rub-beds the stone goes to the polishing and buffing machines where final processes are carried on. Machines in this department are divided into two classes: One kind being used to grind down the surface of the slab by means of a flat iron disk 20 inches in diameter, into which are fitted sections of emery stone; while the second kind has a flat iron disk on the surface of which felt is stretched.

In the plant being described a five-horsepower motor running at 1,700 revolutions per minute, arranged for wall suspension, is fastened to an upright post. The motor is connected by means of beveled gears to a vertical shaft on a double swinging bracket arm. The grinding disk is belt connected from this shaft which allows it to be swung in any direction horizontally.

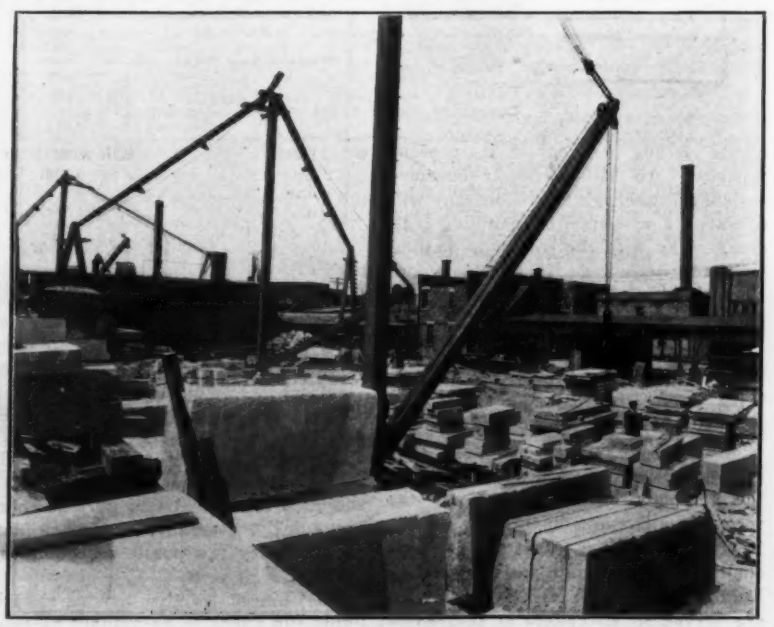
The disk is 20 inches in diameter, revolves at a speed of 500 revolutions per minute and is capable of polishing a slab of any size up to 10 feet in width. Where the emery blocks are used, a constant stream of water is poured on the marble slab, but when the felt polishing wheels are in operation a compound is used.

Tests made in this department since the installation of the electric motors show that the output of the machines has been increased 100 per cent. Also, with the old belt drive it was found that the nine machines installed in this department took 3.5 horsepower running idle and about eight horsepower when operating under load. Since the direct drive has been applied, however, it is found that a five-horsepower motor is ample.

In addition to the machines already described there is installed in this particular plant a 15-horsepower induction motor, driving three lathes used for turning large marble columns, three planers used for cutting grooves in stone, an emery wheel and a small stone crusher.

The following tests of power required to operate marble and stone-polishing wheels were made from an installation comprising a "bed" wheel 12 feet in diameter, 4 inches thick and weighing 8.5 tons, which is mounted on a vertical shaft, the lower end of which rests on a ball bearing. This bed wheel is supplied with water and sand of varying degrees of fineness, depending on the work.

The slabs of marble, slate or soapstone to be worked are supported on this bed wheel by means of a wooden frame, in such a manner as to grind or polish, as required. A 15-horsepower 220-volt direct-current motor, operating at 1,125 revolutions per minute, was connected through a nine-inch belt to a 48-inch pulley mounted on a countershaft 19 feet distant. The speed of the countershaft was 230 revolutions per minute. From the countershaft a drum pulley, 18 inches in diameter and 24-inch face, transmitted power through a 10-inch belt to a fast pulley, 48 inches in diameter by 12-inch face, which is mounted next to a loose pulley of similar diameter and face on a shaft seven feet away. This shaft has a speed of 86 revolutions per minute and transmits power to a vertical shaft supplying the bed wheel through a pair of bevel gears, 20 by 50 teeth. Between 3 to 5 minutes are required to bring the bed wheel up to speed. When the bed wheel is to be used, the motor is started on a countershaft operated at full speed, and the shift is then carefully thrown over. When starting the bed wheel, the power required is 18 horsepower. At full speed running idle, the bed wheel required 4.5 horsepower. With the heaviest load of polishing and grinding that could be obtained, seven horsepower was required.



Electric Derricks in Stone Yard.

Commercial Practice
Management, Rates, New Business

Central-Station Business in Minneapolis.

During the week ending July 3 the Minneapolis General Electric Company secured contracts for 220 lighting customers with 204 kilowatts lighting capacity and 20 power customers with 822 horsepower in motors. The latter includes 335 horsepower for the Cereal Grading Company, displacing a 400-horsepower steam installation, and 300 horsepower for the Northern Welding Company which represents an increase of 200 per cent in its present capacity. An 85-horsepower contract with the Pittsburgh Coal Company will operate a new system for handling coal, doing away with the conveyor method and substituting an improved scoop. Forty-four contracts were taken for wiring already built houses.

Central-Station Electric Bungalow.

By an "Electric Bungalow" the Maysville, Ky., Gas Company is demonstrating the varied uses of electricity to the people of that community, the company having profited by the recent similar demonstration of the Kentucky Utilities Company, which conducted a cottage at Lexington. Lunches, cooked on electric appliances, are served to all callers at the Maysville bungalow.

Central-Station Folder for Chinese Laundrymen.

The accompanying illustration shows the cover and inside leaves of a pamphlet recently prepared by the Western Electric Company for distribution by central-station companies among Chinese laundrymen. As will be observed the text is printed in Chinese, with the English translation, this feature appealing to the patriotism of the prospect.

The arguments presented in favor of electric washing machines are pertinent and timely as will be seen from the following excerpt:

Washing and wringing!

These things make up the hardest part of your laundry work.

Would you like to make the washing and wringing-out of the clothes the easiest part of your day's work? Would you like to make it even easier than the ironing?

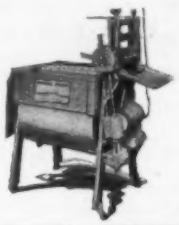
A Western Electric washing machine operated by electricity will do every bit of your laundry work except the ironing. It washes the clothes, scrubs and rubs them, and then wrings them out quickly, carefully, and much better than they can possibly be done by hand.

No Chinese laundry having electric lights can afford to be without an electric washing machine. It costs little to buy, little to use, and does its work at such a saving of time and expense that it is possible for the laundryman to take in more business and increase his profits.

The laundryman who is progressive and makes use of modern methods is the man who gets the most and best customers.

The
Western Electric
Washing and Wringing
Machine
(Operated by electricity)

A time, work and money saver



Washing and wringing!

These things make up the hardest part of your laundry work.

Would you like to make the washing and wringing-out of the clothes the easiest part of your day's work? Would you like to make it even easier than the ironing?

A Western Electric Washing Machine, operated by electricity, will do every bit of your laundry work except the ironing. It washes the clothes, scrubs and rubs them, and then wrings them out quickly, carefully, and much better than they can possibly be done by hand.

No Chinese laundry having electric lights can afford to be without an electric washing machine. It costs little to buy, little to use, and does its work at such a saving of time and expense that it *is* possible for the laundryman to take in more business and increase his profits.

The laundryman who is progressive and makes use of modern methods is the man who gets the most and best customers.

頓士威
力都澤依
倫聖
偽水絞衣洗
(動運力電以)
節省時候人力經費

洗衣機絞水

此二事也。實爲衣舘工夫之最辛苦者也。業衣舘諸君。其欲使洗衣絞水等工。爲每日最易之工耶。其欲使此等工。尤易于與衣耶。若用一威士頓依澤都力聖倫洗衣偽。則衣舘各項工夫。除熨衣外。皆可代爲勃勞矣。蓋此洗衣偽。能代爲洗刷衣服。而又能代爲絞水。絞工迅速。絞諸手力。尤勝一籌。凡華人衣舘。若絞裝有電火者。不可缺此電力洗衣偽。蓋買一電力偽洗衣偽。所耗者無幾。用時亦所費甚微。而其所成之工。則節時候。省經費。若一旦生意興盛。工夫繁多。皆可以藉此偽而做。以此推算。獲利之厚。可知矣。凡業衣舘者。希望進步。採用新法。自可招徠良善之顧客矣。

Cover and Inside Pages of Booklet Prepared for Central-Station Distribution.

Central Station Sees Prosperity.

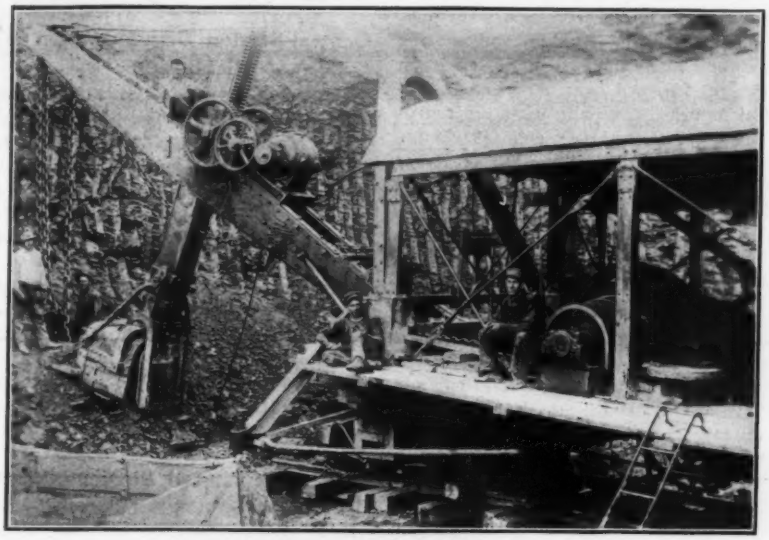
"Everything is on the up grade and our only danger lies in the possibility of having to add another column for our bank accounts," is the way Donald McDonald, general manager of the Louisville Gas & Electric Company, sized up the business situation in a recent interview given to a Louisville, Ky., paper. This paper is conducting a department in which prominent men in the various lines of business are quoted on the subject of the psychological depression.

Kansas City Picnic.

Fifteen hundred employees of the Kansas City Electric Light Company, with their families, enjoyed the annual outing at Overland Park on July 25. The Missouri & Kansas interurban provided 25 special cars to convey the picnickers to the scene of the outing. A wild west show, athletic events and other features were in evidence.

Electrification of Brick Plant.

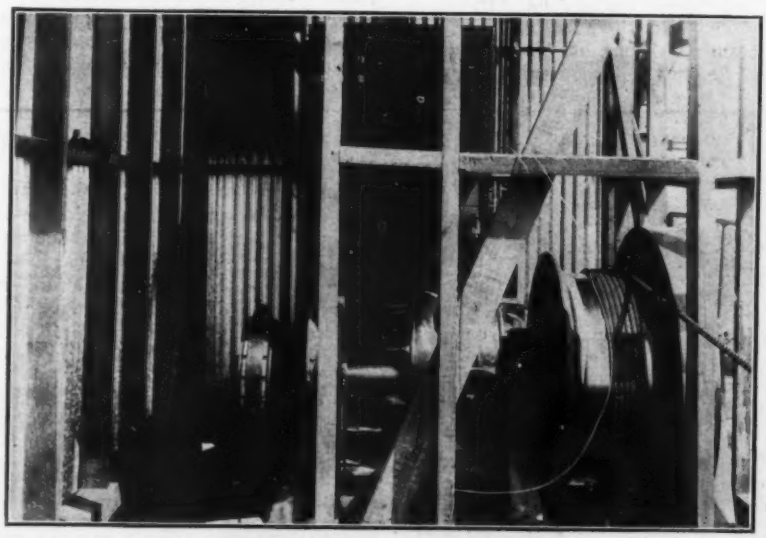
With every operation in the process of manufacture of brick made practically automatic by electrification, the Springfield Paving Brick Company, Springfield, Ill., has completed the installation of nearly 600 horsepower in motors to supplant steam.



Steam Shovel Converted to Electric Drive.

The plant is one of the largest in the United States and is among the oldest. Its average daily output is nearly 110,000 building bricks, or 85,000 paving blocks.

One of the features of the installation is the conversion of a steam shovel into an electrically equipped one.



Cable Hoist Mechanism.

The shovel was stripped of a 100-horsepower steam engine and boiler and equipped with two motors, one of 52 horsepower on the bed for operating the boom and trucks, and one of 3[illegible] horsepower installed on the boom for a crowder.

At first difficulty was experienced when the shovel jammed into the bank, resulting in overload on the crowder motor and blowing innumerable fuses. This was remedied by the installation of a specially made control, which automatically cares for the resistance on the 37-horsepower motor, keeping the shovel in the bank under all conditions.

A shale haul, 900 yards long, reaching the tipple of the plant, was equipped with a 35-horsepower motor, controlled by one man in full view of the pits. The raw material is automatically dumped into the dry pans by the same motor.

Two 50-horsepower and one 40-horsepower motors operate three dry pans. The ground shale bucket elevator is operated by a 20-horsepower motor and all coarse siftings are returned to the dry pans on a short elevator shaft geared to the same motor.

The ground shale is resifted and conveyed to the pug mill by a belt bucket line on a 15-horsepower motor.

A 40-horsepower motor is applied to the pug mill, elevated 20 feet above the brick machine, pouring the raw mixture directly into the machine.

The actual molding of the brick is done on a Chambers Brothers Company automatic brick and block machine, operated at average speed by one 150-horsepower motor.

Molding, pressing and cutting operations are all completed in the one machine, which, with the conveyors, covers nearly 1,000 feet of floor space. The cutter is geared to the auger and dies on a single lineshaft with the two belt conveyors.

The machine will produce, with the present rating, 240 building brick per minute, and can be changed to 200 paving blocks per minute. The conveyor is 200 feet long and here is the only place in the plant, except the shipping and laying in the kilns, where human hands are necessary.

Men take the green brick from the conveyor and load them on cars for the dryer room. An automatic hoist returns all imperfect and chipped greens to the pug mill.

The dryer room is 225 feet wide and 400 feet long and will accommodate 400 cars at a time. They remain there for 24 hours. Drying is accelerated by the surplus heat of the kilns, handled by an American Blower Company fan operated by a direct-connected 40-horsepower motor.

From the drying room the cars are conveyed by an individual direct-current traction system to the kilns.

The kilns are coaled by an overhead cable-car system, automatically operated from push-button stations every 20 feet apart on 500 yards of track. A neighboring coal mine runs the coal to a pit, dumping it into steel motor cars, operated by one man, who can automatically dump coal at each of the ten kilns as he passes over.

In all, there are 17 motors in use at the plant, making a total of 597.5 horsepower. A machine shop is equipped, and a motor in the sump at the pit is belted to a rotary water pump handling 450 gallons per minute. This can be diverted into an individual system of pipes for fire protection.

The current for the installation comes from the Springfield Gas & Electric Company at 6,600 volts. Three transformers at the plant reduce the voltage to 440 for power and 220 for lighting.

Floodwood Power to be Supplied at Low Rates to Athens.

Following a favorable report by a special committee appointed to investigate an offer on the part of the Central Power Company, which is building a large electric power plant at Floodwood, O., to purchase the municipal plant at Athens, O., and furnish current to the city for all purposes at low rates, the City Council of Athens accepted the company's proposition, and ordinances in accordance with it will therefore be adopted. The proposition involves the sale of the city's generating and distribution system to the power company for $15,000 cash, the granting of a 25-year franchise to the company authorizing it to do a general central-station business in the city, with a ten-year contract for street lighting embodying certain stipulated rates for that and other service, and a contract with the power company under which it will supply power to the city for use in pumping water for municipal and domestic purposes.

The rates offered by the company are much lower than those now charged by the city, those for small consumers being seven cents per kilowatt-hour, with a five-per-cent discount for prompt payment, a minimum monthly charge of 50 cents, and no charge for meter rent, as compared with a ten-cent rate charged by the city, a monthly minimum of 75 cents and a 15-cent monthly meter rental charge. Rates for commercial consumers are correspondingly low, and average 20 per cent lower than those charged by the city, while current is offered for manufacturing purposes ranging from three cents down to 8.5 mills. The city had insufficient capacity to offer any current to consumers. These considerations were largely responsible for the action of the Council accepting the company's proposition.

The power will be supplied from the large plant which the company is building at the coal mines at Floodwood, some ten miles distant from Athens.

"So the People May Know."

"So The People May Know," is the title of a series of editorials for the Toledo Railways & Light Company written by Henry L. Doherty and published in connection with the campaign of education that the Toledo Railways & Light Company has been conducting at Toledo, O. This series of editorials sets forth the modern, intelligent, public-opinion-conserving policy adopted by the Doherty organization in educating the public which it serves to a true appreciation of its responsibilities and opportunities. The editorials comprise a most instructive array of facts connected with the public utility business. A very interesting feature of these editorials relates to the offer of prizes to the people of Toledo for criticisms with respect to the policy of the company and the operation of its utilities. These criticisms were published freely and frankly, and specific answer made to every criticism brought forward over a period of several months. The editorials are reproduced in substantial and handsome form by the Blade Printing & Paper Company of Toledo, O., and will be furnished to those interested at $2.00 per copy, post paid.

Advertising Stamps Used by the New York Edison Company.

The New York Edison Company has recently issued a serise of adhesive advertising stamps for general use and distribution, calling attention in a novel way to the various appliances and services enjoyed by the user of electric energy. This form of advertising has been employed to a considerable extent in Germany, and the Edison Company is among the first of the central-station companies to adopt the idea in this country.

These stamps are approximately two inches square, and are issued in perforated sheets. They are printed in several colors, each stamp carrying a catchy four-line rhyme, arranged in order of the different letters of the alphabet, as, for example:

A represents the shining Arc,
All children love its light
Because it keeps off bogey-men
Who lurk around at night.

O stands for Organ that the man
Now plays with greatest zest
Because a motor does the work
And gives his feet a rest.

Employees of Cleveland Central Station Receive Handsome Bonus.

Fifty-six employees of the Cleveland Electric Illuminating Company received checks for various sums totaling $35,000 on July 13, the amount each received representing five per cent of his total salary for the past ten years with four per cent interest. The employees thus favored, in addition to the amount they received, have been paid a three per cent annual dividend on their salaries for the ten-year period. Ten years ago President Scovil and Vice-President Lindsay decided to start an employees' gratuity fund, to be participated in by those employees who had been with the company a year or more and had proven efficient and trustworthy. The number to receive the decennial payments will increase each year from now on, until in 1924 about 650 will receive benefits.

"We believe our plan makes better employees and better citizens," Vice-President Lindsay said. "It certainly increases and promotes efficiency and raises the standard of our general organization."

Central-Station Demonstration in Sandusky.

The Sandusky Gas & Electric Company, Sandusky, O., took advantage of the "Made-in-Sandusky" exposition held in that city recently in connection with the homecoming celebration to show visitors what could be done with electricity and gas, for lighting, heating and the operation of various domestic conveniences. Its booth in the display was by far the best lighted on the grounds and the variety of novel and convenient household articles shown in operation was such as to attract much attention, giving the company plenty of the right kind of publicity.

Cincinnati Picnic.

The annual outing of the employees of the Union Gas & Electric Company, of Cincinnati, O., was held on July 18 at Highland Grove, about 800 employees and guests attending. One of the interesting features of the day, to which the entire crowd gave the closest possible attention, was the ball game between the gas and electric departments, which was won by the latter by the score of 5 to 3, after a hot contest. Besides this and the usual big picnic dinner, the entertainment provided for the employees consisted of a wide variety of athletic events, ranging from a race for fat men to one for girls from 5 to 8 years of age.

Electric Lighting Promotes Safety of Children.

The recent advertising of the Mammoth Spring Electric Light & Power Company, operating in Koshkonong, Mo., and adjacent towns, has been given a twist likely to appeal forcibly to parents of children. The fact that children are prone to tamper with lights is given as one potent reason why gas should give way in favor of electric lights, the latter being absolutely without danger, while the former have resulted in many fatal accidents. Electric lights also are more healthful.

Wiring Campaign in Franklin.

Good results are being obtained from the house-wiring campaign which the Franklin (Ky.) Electric & Ice Company is conducting in that city. Special prices have been offered for July and August and the advertisements guarantee absence of dirt or confusion and no damage to the walls or ceilings.

Electric Sign Data

Pending Sign Legislation in Utah.

A proposed ordinance changing the construction and maintenance of signs from the old bond to a license system was presented to the City Commission of Salt Lake City, Utah, recently by Commissioner H. W. Lawrence.

The new measure does away with the expensive bond system under which merchants in the past have had to furnish bonds aggregating millions of dollars to guarantee the city against damages in case of accident. Under the new arrangement a license fee will be charged for erection of all signs and an annual inspection fee will have to be paid. From the revenues thus received the city will, by resolution, set apart a certain percentage to pay damage claims in case of an accident from a sign.

The ordinance requires that a permit must be secured for erection of any sign over, in or about any street or public way in the city. All signs extending more than two feet out from the property line must be constructed of metal or other noncombustible material and must be illuminated with at least ten candlepower per square foot of exposed surface. No piece of glass with an area of more than one square foot can be used in the exposed surface of any projecting sign. Every sign shall be placed at least ten feet above the surface of the public way over which it hangs and the building end shall not be more than two feet from the building. Signs erected after August 1 must not extend more than ten feet from the building in full length. It is further provided that after August 1 all signs hanging out from buildings and not illuminated must be illuminated or taken down. The ordinance also required that all illuminated signs must be kept illuminated at least seven hours each week. This is to do away with a lot of dead signs.

The fees provided are as follows:

For signs projecting from buildings—for construction $3; for inspection eight cents per square foot up to 30 square feet and six cents per foot above that. For roof signs and those parallel with the buildings—for construction $2; for inspection $1.00 per square foot. If the sign is illuminated, there will be an additional fee of $1.00 for the first five lights and five cents for each additional light. All fees are payable in advance save the inspection, which is paid immediately after the inspection is made.

Electric signs are coming into favor in Kansas City in a number of new connections. Banks, which have advertised sparingly in the past, because of the conservatism which must attach to such institutions, are utilizing electric signs in their windows in many cases. Another new development is the use of electric signs by contractors in charge of construction work of importance. The De Graff Construction Company, of Seattle, Wash., which is building the Twelfth-Street viaduct, has erected a big electric sign, announcing it is in charge of that project. An odd feature in connection with this plan is the use of the name of the United States Fidelity & Guaranty Company. This concern is on the contractors' bond and used electricity to acquaint observers with that fact. The cost of the sign was divided between the contractor and the bonding company.

Considerable attention has been attracted to a novel and spectacular skeleton roof sign recently erected in Chicago by the Federal Sign System (Electric). The peculiar feature of this sign is that the main wording rotates before the eye of the observer.

The sign consists of a framework supporting a 15-foot hollow steel ball carrying about its equator the legend "Empire Fireproof Storage" in 30-inch illuminated raised letters. A solid-steel vertical axle extending through the steel globe rests upon a ball bearing situated in a pent-house on the roof. Driven by a two-horsepower motor, also installed in the pent-house, the ball actually revolves. In addition to the main legend the framework of the sign carries a double-faced sign outlining a colored crown and the words "moving" and "packing," in 24-inch letters.

Tungsten lamps of the five-watt, 11-volt type have been used to equip the 627 sockets in the sign. These lamps receive their electrical energy from a 3-kilowatt transformer connected to a 110-volt circuit. Those lamps on the moving ball are supplied with energy through slip-rings attached to the axle of the ball inside the pent-house.

The overhanging signs on Clark Street, Chicago, Ill., are to be removed. Mayor Harrison and Mr. Kostner, deputy commissioner of Public Works, were instrumental in issuing an order notifying the property owners to remove all overhead signs. No objection was made to the signs which lie flat against the buildings. This order will affect 132 signs.

Spectacular sign erected for Levy's department store at Fourth and Chestnut Streets, Louisville, Ky.
700 five-watt lamps are used in this sign, a particular feature of which is the Betts & Betts electric clock.
Sign burns continuously.

Electrical Construction

CRANE WIRING.

By George Gorman.

It is the object of this article to give some practical information relating to the installation of contact conductors for traveling cranes, particularly as regards the substitution of metal supports for the conductors in place of the wooden ones that are frequently used. While wooden blocks have widely been applied for the purpose of supporting and insulating contact conductors for cranes, their application should not be advocated

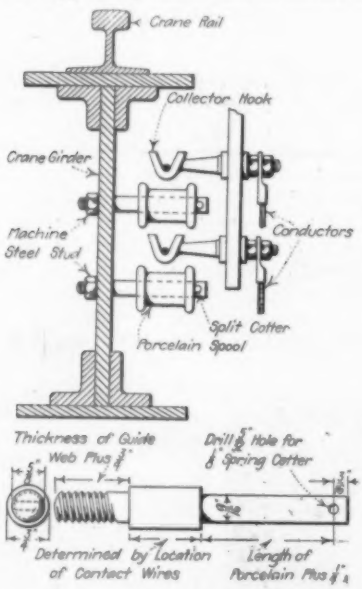


Fig. 1.—Contact Wire Supports on Steel Girders.

except in special instances. If the crane is located under shelter where the blocks are not exposed to the action of the weather, they may give fair satisfaction. However, if the crane is out of doors, or if the conditions are such that moisture and dryness can alternately affect the wood, trouble is sure to result. The block will expand and shrink as it becomes moist or dry, and eventually the bolts that support it and that support the contact conductor will become loose.

One of the simplest methods of carrying the contact conductor along a crane runway is shown in Fig. 1. The web of the crane girder is drilled for a five-eighth-inch stud, shown in the lower half of Fig. 1, and on this stud after it has been bolted to the girder, is mounted a porcelain bobbin, as illustrated in Fig. 1. This stud should be turned from machinery or cold rolled round steel bar. A split cotter pin is inserted in the outer end of the stud to hold the porcelain in position. It affords a means whereby the bobbin is held in position and it can be easily removed if the bobbin breaks.

If the girder is of the box type instead

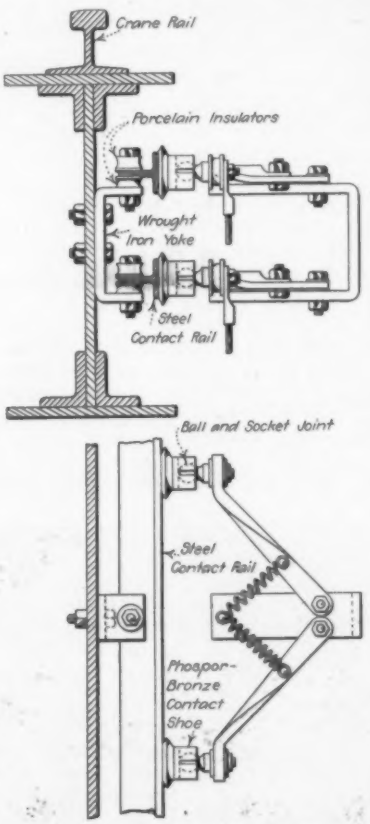


Fig. 2.—T-Section Contact Rail.

of the plate type shown in Fig. 1, the studs may be screwed into tapped holes at stiffeners, where an adequate thickness of metal in which the threaded end of the stud can engage will be found.

Another type of support for contact wires that has the advantage that it can be adjusted through a certain range to correct for inaccuracy in drilling the supporting bolt holes is shown in Fig. 3. The arrangement comprises a cast-iron boss, into which a T-piece rests, and wherein it is held by a set screw. The T-piece is detailed in Fig. 3. The contact conductors are carried in pulley-shaped porcelains which are supported by the T-shaped pieces on machine steel studs as seen in Fig. 4. After the boss has been bolted to the web of the crane girder, the T-shaped piece can be moved in or out, or it can be turned in its socket, which provides for correction of alignment and elevation of the contact wires.

A more elaborate arrangement is illustrated in Fig. 2. This device has been used in industrial plants, particularly in steel mills where reliability is all-important. It probably represents the most advanced practice as to the installation

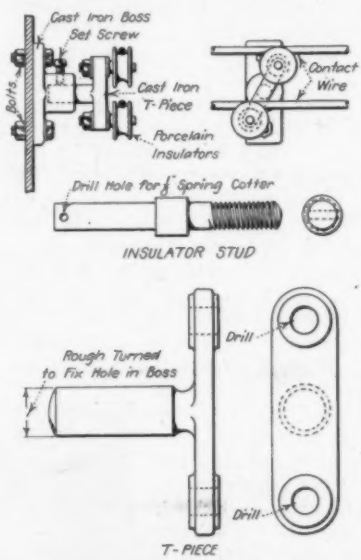


Fig. 3.—Adjustable Support for Contact Wires Showing Details.

of contact conductors for cranes. The contact conductor itself consists of a steel T-bar. A 1½-by1½-by3/16-inch section is the smallest that is ordinarily used. Sometimes 2-by-2-inch sections are utilized. The large industrial plants endeavor to keep in stock standard insulators of the type shown in Fig. 2, and also a supply of structural steel T-bars. Ordinarily only one size of T-bars is stocked. Where crane motors are of such large imput that one T-bar does not provide sufficient section to carry the current, two or more T-bars are arranged in multiple and the cranes carry contact shoes multiple connected accordingly. This provision makes it possible to carry in stock only one kind of fitting, which is an obvious advantage. Contact rails of structural steel are considerably more

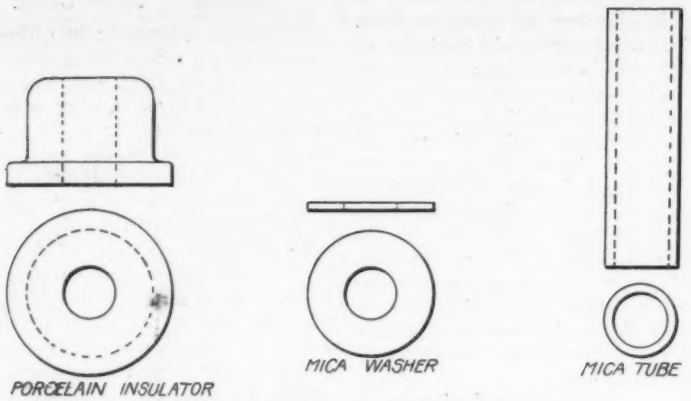


Fig. 4.—Insulation for T Contact Rail.

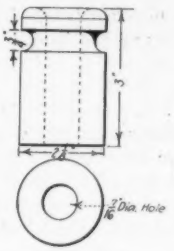


Fig. 5.—Dimensions of Knob Used for Intermediate Support.

expensive than copper contact wires, but the properties that they have of practically never breaking or giving trouble after they are once installed, and of supporting themselves with reasonable rigidness, between the points where they are attached to and insulated from the crane runway, more than offset the feature of high cost.

The insulators for electrically separating the T-rails from the steel supporting pieces are detailed in Fig. 4. Two insulators are used at each point of support. A mica washer is inserted between the face of each insulator and the web of the T and also under the head of the clamping bolt and between each lower insulator and the yoke to prevent the porcelains from cracking when the bolt is tightened. A mica sleeve is used to bush the holes through the insulators, which prevents the bolt from making a contact with the T-rail.

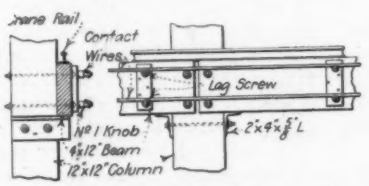


Fig. 6.—Intermediate Support on Wooden Runway.

The collector shoes shown in Fig. 2 are of gun metal and are mounted on ball-headed bolts attached to the crane. This device allows the shoes movement in practically every direction, and insures a firm contact against the contact rail.

Fig. 9.—Porcelain Strain Insulator Supporting Contact Wire.

The best, and also the most expensive, method of installing contact rails is shown in Fig. 2. One of the cheapest, but one which will at the same time give fair satisfaction on a wooden runway under favorable conditions, is shown in Fig. 6. With this arrangement the contact wire is carried on No. 1 porcelain insulators (Fig. 5.) which are fastened with lag screws to cleats nailed to the wooden crane runway. These insulators, constituting the intermediate supports, should be spaced about 18 feet between centers. The contact wire normally lies in a groove in the insulator. When the crane passes, its hook collectors lift the wire from the groove temporarily but permit it to fall back in again after the crane has passed.

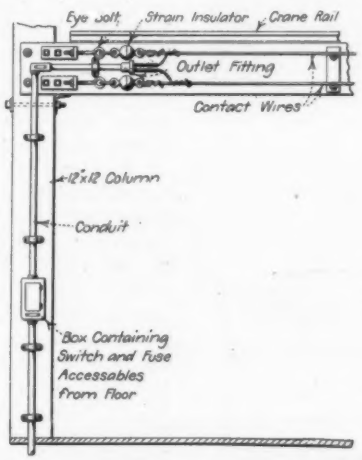


Fig. 7.—Termination on Wooden Runway.

Another method of arranging an intermediate support for contact wires is shown in Fig. 8. Castings or forgings having a Y-shaped end are held with wood screws or bolts to the crane runway if it be of wood, or to painted wooden blocks if the runway is of steel. A plate of mica is inserted between the turn of the Y-brackets and the screw holes are bushed with varnished fiber tubes. It is important that the fiber used for such purposes be varnished, because raw fiber, although a good insulator when dry, is not particularly good when wet. In placing the Y-brackets, they should be carefully located so that when the hook collector of the crane passes each bracket, there will be at least 0.75-inch clearance between the collector hook and the bracket. Unless the brackets are accurately located as above suggested, there are likely to be accidents due to the interference of the collector hooks with the brackets.

When installing the brackets, it will save time if a gauge or template is made of wood or sheet metal whereby the bracket screws can be located quickly a certain fixed distance below the crane rail.

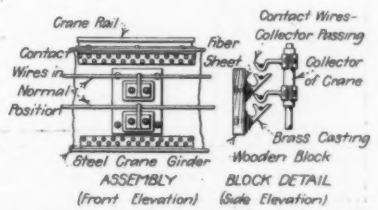


Fig. 8.—Brass-Casting Intermediate Support.

A method of terminating the contact wire for a crane is shown in Fig. 7. The L-shaped pieces, *A*, are forged from ⅝-by-2-inch wrought iron, and each leg of the angle should be about six inches long. The exact length of the leg that extends out from the crane girder is determined by the location that the contact wire must assume in order to satisfy the clearances specified by the crane builder. Each L-shaped piece is secured to the crane beam with two five-eighth-inch bolts. Lag screws are sometimes used for the purpose, but through bolts

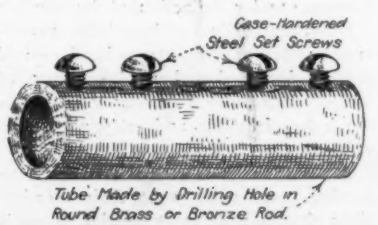


Fig. 10.—Tubular Connector for Crane Contact Wires.

are much to be preferred. An eye bolt engaging in the hole in the outer end of each of the angles provide means of taking up the slack in the contact wire. A strain insulator is inserted between the contact wire and the hook bolt, as illustrated.

Porcelain strain insulators of the type shown in Fig. 9 have lately been used for electric crane contact wires, and appear to give satisfaction where the contact wire is not of too great a diameter. The old practice was to use the composition strain insulator originally designed for insertion in span wires supporting electric railway trolley wires. Porcelain insulators are much cheaper, are not hygroscopic, will not break down under ordinary static discharges, and do not disintegrate under the action of the weather.

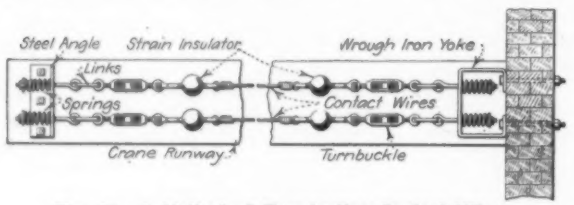


Fig. 11.—A Method of Terminating Contact Wires.

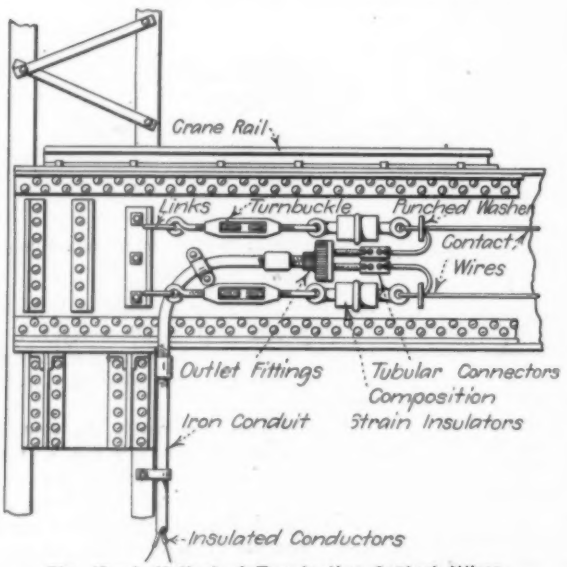


Fig. 12.—A Method of Terminating Contact Wires.

However, difficulty has been experienced with porcelain strain insulators of certain forms that have been installed out of doors, due to water getting into the holes, freezing, and cracking the insulators.

A somewhat elaborate scheme for supporting contact wires at their terminations that is used in industrial plants in England is shown at Fig. 11. The arrangement differs from that ordinarily employed in the United States, in that springs under compression, are provided at each end of the contact wire so that it will always remain tight even when the changes in temperature are extreme. The springs should be quite heavy so that ordinarily they will deflect but little. In Fig. 11, ball-type strain insulators of the sort used in trolley construction are inserted between the contact wire and the termination fixtures, and turn buckles are provided to permit of the adjustment of the tension in the contact wire. In the United States it has not, to the writer's knowledge, ever been thought necessary to provide springs at the ends of the contact-wire runs. It is altogether probable, however, that in certain instances where considerable difficulty has been experienced, due to the breaking of contact wires, that the provision of springs would remedy conditions.

Where a contact wire is dead ended on the strain insulator at the end of a run, it is not necessary to make up the wire about itself as shown in Figs. 7 and 11. The device that is being used successfully in many large plants consists merely of a punched steel washer for a one-half-inch or larger bolt applied as shown in Fig. 9. The end of the contact wire is passed through the strain insulator, the iron washer is plased on the wire, then the free end is brought back and inserted through the hole in the insulator and given a bend in the reverse direction. The washer holds the wire securely and has the advantage that the wire can be taken down very quickly when necessary. Heavy tubular connectors, shown in Fig. 12 and detailed in Fig. 10, having brass bodies and steel set screws should be used for connecting the contact wire to the source of power. These connectors are much better than wrapped joints because they can be disconnected in minimum time when repairs are necessary.

Cable to Bahamas.

The question is being considered of laying an additional submarine cable between Jupiter Inlet, Florida, and Hassan in the Bahamas, or of installing more powerful wireless service between stations in Florida and the Bahama Islands.

Estimating Labor Costs.

Estimators agree that in estimating labor, they go wrong more frequently than anywhere else; and everybody knows that an error in labor costs due to faulty estimating can easily wipe all of the profit out of the job, and in the case of unusually important work may even threaten the very existence of the business itself.

So convinced are some of the members of the contracting business that labor is an uncertain proposition, and that they are at the mercy of chance and circumstance when they tackle a job, that they confine their work, preferably, to numerous small jobs, feeling safer in case of mistakes developing than they would if they were putting all of their eggs in one basket and plunging on a very large proposition. They point out that they may miss it two out of five times on little work, and still be safe; but that if one big job should go against them in the matter of excessive labor costs, they may be put out of business.

The importance of this matter is emphasized by the fact that a great many, if not most, electrical contractors figure their overhead on a basis of the labor expense involved. Consequently, if the labor item has been underestimated, it not only causes a loss in that particular, but likewise makes the overhead too small for the job, and thus doubles up the error. It is true that an error in estimating materials is reflected, as a rule, in the labor item, since more labor must be required, ordinarily, to install the additional material; but as it is a great deal easier to figure material than labor, attention for the present may be confined to the latter.

In the first place, of course, the unit system of estimating labor is the only safe plan. Attempting to take in a job at a glance, comprehensively, and out of the depths of experience or inspiration determine how much labor will be required to handle the job, is a difficult task; so difficult, in fact, that none but the seventh son of a seventh son should attempt it. Yet many contractors who ought to know better fail to analyze the labor elements entering into a job properly, and thus open the way to errors of greater or less degree.

The National Electrical Contractors' Association has recommended the use of a separate labor unit covering every detail of a job; and while this is the ideal system, contractors in practice prefer to use somewhat larger units for the sake of speed in estimating. Without question, however, the unit should be so small that the factor of the unknown will be made as small as possible. It is a good deal easier to

make a mistake in figuring the labor requirements of a whole floor than it it to determine how much labor will be required to put in a switch; and by taking each item separately, the chances for mistakes will be almost eliminated, though they will always be present to some extent.

Checking estimate against actual facts is another excellent method of meeting the labor problem. The contractor who doesn't carefully go over his time-sheets on every job, checking them against the estimate which was the basis for the charge, is simply throwing his experience onto the ash pile. Patrick Henry declared on a notable occasion that he had but one lamp by which his feet were guided; and that lamp was the lamp of experience. This reasoning is just as applicable to electrical contracting as to statesmanship; and the contractor who checks up every job, sees where the mistakes were made, and learns how they happened, is going to be a better estimator as he goes along.

In case a special post for estimating work has been established, this checking operation serves the very useful purpose of keeping the estimator on his toes. If his boss calls him up to the desk to explain why he made a 20-per-cent error in labor costs, he is going to figure very carefully on the next job to avoid having a repetition of the incident. On the other hand, the fault may have lain in the other direction, and the men may have soldiered and killed time. If that is the case, the time-cards showing the work each man did every day will help to point out the chaps who failed to give value in return for the money in their pay envelopes.

It is not to suggest that the contractor must turn into a slave-driver, and be constantly on the necks of his employees if they don't deliver quite as much as he had expected; but the normal effect on the men of knowing that their work is being checked over, and that if they fail to make a good showing, it will all come out in the wash, is mighty good. It must be admitted that the contractor is largely at the mercy of his men in this respect, and that it takes a good diplomat and a good "jollier" to keep every fellow turning in a 100-per-cent ticket every day; but if he cannot control this feature absolutely, he can at least estimate the chronic soldiers, and get rid of those who show constantly that they are not trying to do a day's work every day.

"I suppose some of my men cut their time, and I know a lot of them kill time while they are on the job," said a successful contractor recently. "If they come to work at 8 and quit at 4, it makes my pay high for labor on that job, and all the skilled estimating in the world isn't going to meet that condition. But my records and checks will tell me, when I go over that job, that something was wrong; and by tactfully pointing out to the men that I know they are not delivering, I let them know that I am wise, and that good work must be forthcoming if they are to stay on the payroll. I believe this is better than 'bawling out' every man I suspect of laying down on the job, because a workman can always take advantage of the situation."

Having the records of every job gives the contractor the opportunity to get something fairly accurate by averaging up the whole thing. He might go wrong by taking the time sheet on Job No. 1, because that might run too low; while No. 2 would be too high. By the time he has 100 or 500 jobs from which to make up his average, however, his figures are worth something, and are an excellent guide, even if not an infallible indicator of the actual labor costs.

The chief asset of the estimator is judgment. That is a mental quality which can hardly be described, and yet everybody appreciates the importance of it. A skilled estimator, who rightly prides himself on his ability to figure the labor and other costs of a job, said recently that it is necessary at all times to guard his judgment from being warped from outside factors.

"I try," he said, "never to trifle with my judgment by guessing even on the most unimportant thing, if it is possible to substitute facts for guess-work. I seldom or never use short-cuts, having found that these open up the way to leaving out important items. I always approach a job with an open mind, without trying to arrive at even a tentative conclusion before I have got into the figures. By refusing to yield to the temptation to slide over this or that point of a job, I have strengthened my judgment and reinforced it by experience until I believe it is an asset worth something to me and to the house with which I am connected."

The electrical contractors can afford to take a leaf from the book of the printers. The disciples of Ben Franklin were, until a few years ago, about the poorest business men in the country. They were a trade of price-cutters taking them by and large, and education on costs was a minus quantity. Organization work has gone far in the direction of solving their problems. They have Ben Franklin Clubs in all the large cities; and besides discussing estimating work occasionally, many of them have special estimating classes, meeting once a week, where nothing but the problems of the estimator are gone into. Everybody present analyzes the jobs which are presented, and the results are compared and the figures proven, so that every fellow finds out where he made his mistakes—and doesn't repeat them in practice.

If a printer finds a competitor who has quoted what appears to be an impossibly low price on a job, he brings the proposition before the estimating class, not in a spirit of pique or spite, but for the good of the cause and the education of everybody. That job is gone over, and when the estimating class gets through, everybody knows whether the man who got the bid is going to lose money, and how much. And it is seldom that the cut-price printer is envied by those who know just what his work is producing in the way of net profits.

Suggestions have been made in the direction of a school for estimators. The idea is a good one, especially as it is practicable; certainly it would be as easy to bring the estimators of each city together in a special class of the contractors' association as it is for the printers to have work of this kind; and the results could not be otherwise than good. Since so many features of estimating are intangible, and must be figured according to the judgment of the estimator, discussing debatable points and comparing experiences is the surest possible way of strengthening judgment and making each man a better estimator. This is an opportunity that ought to be taken advantage of.

Electric Vacuum Cleaners in Norway.

United States Consul General Michael J. Hendrick, of Christiania, Norway, states in a recent report that, the cost of electric power being low, a good market exists in that city for light-weight, well constructed, good-quality electric vacuum cleaners, which can be retailed at 125 to 150 crowns ($33.50 to $40.20). During the past two years the use of vacuum cleaners operated by hand and retailing at 30 to 50 crowns ($8.04 to $13.40), has been increasing, but these are now being discarded, as they proved too heavy for the housewives and servant girls to operate. Some of these were American, but the greater portion were of German production. The Norwegian import duty on cleaners is 10 per cent ad valorem; the usual terms of credit are 30 days. Folders intended for purchasers' use should be in Norwegian, but correspondence may be in either Norwegian or English. Prices should be quoted f. o. b. steamship at Boston, New York, Philadelphia, Newport News, or Gulf ports.

The production of coal in Arkansas in 1913 was 2,234,107 short tons.

COST METHODS IN ELECTRICAL CONTRACTING.

By E. M. Raetz.

The efficient handling of work is one of the biggest problems with which the electrical contractor has to deal for on this one thing will depend whether or not he will make a profit on a job. In the system described everything has been elminated which could advantageously be done away with so as not to encumber the system. Many changes have been made since it was first inaugurated and at the present time it is found to have minimized the chance for error or delay and to be well adapted to the requirements of the average shop where not over ten men are employed. In larger shops a more elaborate system would be required to keep accurate records of the various work under way.

When a call or an order for any job is received a shop order is immediately made out. On this order are given the date on which the order is received, the name of the party for whom the work is to be done, the location of the building where the work is to be done, the name of the person to whom the work is to be charged and a brief outline of the work with such necessary comments as may be required. This order is made out in duplicate, the original being given to the workman who is to do the job and the duplicate being placed on file in case the original is lost. The material required for the job is taken out and charged on a material charge ticket. The man to whom the job is assigned keeps his time on a labor ticket which is turned in daily.

The materials are filed in a 7-by-9-inch file with removable index tabs on which are written the names of the various jobs. The labor is entered from the daily tickets to a total labor card for each job and is also recorded in the time book from which the pay roll is made up. The total-labor cards are 7 by 9 inches and are placed in the file containing the material cards. When a job is completed the credits for material returned are deducted from the charges and the net totals entered on a blank page of a contract book. In the case of small jobs the material and labor are both entered on one sheet, but for larger jobs a separate sheet is used for each. In this way the cost to date of any job can be readily ascertained at any time or stage of the work which is a useful feature of this system when applied to contract work which is carried on over a considerable period of time.

E. M. RAETZ & CO. "THE ELECTRIC SHOP"

For W.B.Jones At 520 W.Fifth St. Date Jan 10 -14 191

Porch 1-6"copper porch ring,receptacle and 7' C.R.I.Bell
Hall 1- square 1-light pendant with link,and 6" amber art shade.
Living Room 1-4 light # 41144 shower, & # 768 shades
Dining Room 1- # 1473 dome,hung 53" from floor.
Bed Room 1-silk drop cord with # 1223 shade
Kitchen 1- nickel pendant-1-lt with # 1280 shades.
Pantry 1 # 4000 sell.receptacle. no shade
Basement 3-brewery cord drops with porcelain sockets
2nd Hall 1-sell-receptacle with # 140 shade
Bath 2-1-lt nickel brackets,pull sockets,no shades,round bulb frosted lamps.
4 Bed Rooms 4-1-lt pendant # 43,with # 78 shades
Attic 1 common drop
Snap Switches 7
Flush Switches 7 & plates(take 1 3-gang)
Cutouts and Fuses 1 entrance switch, 2 double branch & 10 amp fuses
Door Bell, complete XXXXXXXXX 1 inish complete
Line to pole wire # 10 Blts. 2 Ins. 2
Lamps 15-25 watt Mazda 4-60 watt gems(use in attic & basement)
Total

E. M. RAETZ & CO. (by)

Fig. 1.—Typical Estimate Sheet.

Estimates are made out in duplicate, the original being given to the customer and the duplicate being filed for reference in case the job is ordered at some future date. A typical estimate sheet is shown in Fig. 1, the blanks being filled in the usual manner.

A cost record is kept in the manner shown in Fig. 2. Such a form permits of keeping a comparative cost record which is a valuable feature for although no two jobs are alike, many are similar enough to permit future estimates to be based on them.

The overhead expense is taken as a certain percentage of the volume of total business done and is computed every six months. Shop time and lost time are included as a part of the overhead expense. Labor on fixture work is charged to merchandise as it represents part of the price charged for fixtures. All fixtures are priced in this manner and the cost figured up on sheets designed for the purpose.

There are many details which require the attention of the electrical contractor but in these little things lie the essentials of success. A well managed concern makes the least errors, accomplishes the maximum amount of work in a given time and has fewer disputed bills than a firm which gives less attention to the little details that are so necessary for the success of any enterprise in modern times.

E.M. RAETZ & COMPANY

COST REPORT CLASS OF WORK

DATE	NAME OF JOB	DESCRIPTION	SUPPLIES & OUTLETS	MATERIAL	LABOR	TOTAL	CONTRACT	GROSS PROFIT	

Fig. 2.—Form in Which Cost Records are Kept.

Electric Ordinance Considered in Savannah.

According to an ordinance recently introduced in the City Council of Savannah, Ga., all persons engaging in a business of electrical wiring, repairing or construction must furnish the city with a $200 bond. The ordinance was prepared and introduced at the instigation of the city's electrical inspector.

E. J. Burns.

E. J. Burns, who as secretary of the electrical contractors' associations of Illinois and Iowa has effected a substantial reduction in the rate that electrical contractors of these states must pay for liability insurance and who has recently not only offered this rate to members of the National Electrical Contractors' Association but has worked out a scheme whereby the profits ordinarily passing into the hands of the stockholders of a risk company from the premiums charged electrical contractors for liability and compensation insurance will be diverted into the hands of the members of the National Electrical Contractors' Association, is a man whose experience well fits him for the work he has undertaken.

Mr. Burns is a graduate of the Rock Island (Ill.) high school and was first employed in the freight office of the Rock Island Railroad, being promoted to the position of joint freight and passenger agent at Lasalle, Ill., and Peru, Ind., when only about 23 years of age.

E. J. Burns.

He next entered the insurance business, conducting a joint insurance and real estate business in Rock Island. Later Mr. Burns became general manager of the Independent Telephone Company of Moline, Ill., and Davenport, Iowa.

Leaving the independent telephone interests, Mr. Burns became special representative for the legal department of the Bell Telephone Company. Later he severed his connection with the Bell Telephone Company to re-enter the employ of the Independent Telephone Company. Mr. Burns remained with this company until March, 1914.

At the present time Mr. Burns is secretary and treasurer of the electrical contractors' associations of Illinois and Iowa; and as such he is rendering invaluable service to not only the electrical contractors of these states but to electrical contractors in general through his activity in the field of liability and compensation insurance.

Among the Contractors.

The Wilson-Maltman Electric Company of Baltimore, Md., has been awarded the contract for the installation of a municipal electric lighting plant for the town of Easton, Md., at their price of $22,660. This contract calls for the erection of boilers, feedwater heaters, generators, exciters, switchboard, pole line and street lighting fixtures. About 355 poles will be required for the installation, also two 75-kilowatt generators. The Reliance Engineering Company, of Cincinnati, O., are the consulting engineers.

R. C. Bierdemann Company, Chicago, Ill., will wire a number of houses on Olive Street, Chicago.

The committee in charge of the construction of the home for aged women, in Youngstown, O., has let the contract for the electric work to the George D. Webster Company, of that city. The structure will cost $11,925, while alterations costing $1,298 will be made to an older building, making the home modern in every respect.

The Blumenthal-Kahn Electric Company, of Baltimore, Md., has been awarded the contract for the electric installation in the Rivera apartment house being erected in that city. The installation calls for conduit wiring, telephones and fire alarms throughout the entire building. Henry Adams is the consulting engineer and the contract amounts to about $6,000.

The Dommer-Walters Electric Company, of Canton, O., has secured the contract for the installation of the light, power and telephone wiring in the new Gibbs-Avenue school, in that city. In the same building a Tuec vacuum-cleaning system will be installed, the device being manufactured by the United Electric Company, a Canton concern.

Eugene I. Rosenfeld & Company, Baltimore, Md., are working on the illumination of the City Hall dome for the Star Spangled Banner celebration to be held in Baltimore during the coming September. The contract calls for about 5,900 lights all to be wired in galvanized conduit and Crouse Hinds condulets. Hazard 30-per-cent para wire is being used.

The Blumenthal-Kahn Electric Company, Baltimore, Md., has been awarded the contract for the handsome residence of E. B. Hunting at Guilford, Md. The house will cost approximately $60,000. This installation calls for wiring in conduit, vacuum cleaners, burglar alarms, etc. DeVeau telephones will be used throughout.

For the new lighting and decorating scheme of the State Capitol dome, Columbus, O., a description of which was given on May 30, the Simonton Construction Company, of that city, has been awarded the contract. The estimate of cost is $5,000. The plans, drawn by H. H. Heistand, an electrical engineer of New York City, call for 1,500 lights. Permission to beautify the dome was secured from the State authorities, and the expense is being borne by local business men known as the Columbus Conventions and Publicity Association. Any subcontracts for materials will be made through the Simonton company. Its headquarters are in the Columbus Savings & Trust building. The work will be pushed to early completion.

The National Electric Company, Baltimore, Md., has been awarded the contract for the electric light and power wiring in the superstructures for the filtration plant for the city of Baltimore. This contract amounts to $10,500. Actual work on the plant will not be begun until about the first of October.

The Electric Construction and Machinery Company has secured the contract to install the ornamental street-lighting posts of the city of Sterling, Ill.

F. L. Decker, Chicago, Ill., has the contract for wiring the South Chicago post office.

A $22,000 contract has been secured by the Erner & Hopkins Company, of Columbus, O., in changing the power equipment of the Pioneer Pole & Shaft Company, Piqua, O., from steam to electricity. Some 74 motors will be installed. A feature of the improvement will be a new Skinner Uniflow engine. The motors are to be three-phase, 60-cycle, 220-volt. Work will be started in about six weeks.

O. L. Bowers, of Columbus, O., has in hand the wiring and lighting improvements of the Protestant Hospital, Columbus, O., also the electrical work for the new Rector physicians' office building in the same city. The latter involves $1,200 in wiring, for an elaborate lighting system and the installation of individual telephones.

The strike of carpenters which has been in progress in Cincinnati, O., for over two months, was recently settled and construction work will now proceed. Electrical contractors have felt the depression due to this strike but expect to be extremely busy for the remainder of the season.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The State Supreme Court has handed down an interesting decision involving the constitutionality of an order of the Railroad Commission requiring physical connection between the long-distance lines of the Pacific Telephone & Telegraph Company and the local lines of two other companies. On the petition of these latter companies, the Commission ordered that connections be made for interchange of service, providing as compensation an apportionment of the tolls. The Commission held that such order was but the exercise of the police power, and that the regulation was reasonable, touching the use of the property held in private ownership but devoted to a public use. In its decision, the Court states that the police power goes merely to the regulation of the public utility, and that, when an order passes beyond proper regulation, it amounts to a taking of the property, with the order then referable, not to the police power, but to the power of eminent domain. The "taking" of property within the meaning of the constitution is held not to mean merely a change or parties, but to include permanent or temporary deprivation of the owner of its use; the Legislature may not subject property devoted by its owners to a public use to another public use or the same public use by its rivals. It is an act relating to the power eminent domain, and compensation must be made accordingly. The Court refused to go into the consideration of the reasonableness of the order of the Commission, because such order was held as a "taking" of property within the meaning of the constitution, and its reasonableness could not effect the result. Accordingly the Court holds that the order is constitutionally beyond the power of the Commission, in that no provision was made for compensating the company in advance of the taking of such property, and further, the apportionment of rates or tolls for service to be rendered in the future is not a compensation for the present taking of property.

INDIANA.

The Cumberland Telephone & Telegraph Company applied to the Commission for permission to adjust and raise rates in 49 stations in Southern Indiana. A number of hearings have been held, but it is understood that a settlement has been reached by which all inequalities and discriminations will be eliminated and the regular rates remain unchanged. The Cumberland Company is to file a revised schedule and a hearing will be called for the purpose of ascertaining if the matter has been satisfactorily concluded.

The City of Richmond, through its Board of Public Works, has applied for premission to reduce its rates for supplying electric current from its municipal plant for power purposes.

MASSACHUSETTS.

Northampton Electric Lighting Company. Upon complaint, the Board of Gas and Electric Light Commissioners issued a decision June 26, 1914, fixing maximum rates for electric service in Northampton. The decision states that "for reasons which have been repeatedly discussed by the Board, and therefore need not be repeated here, it has seemed undesirable, upon a petition of this kind, to deal specifically with any prices other than those for street lighting and the maximum net price to commercial customers. Other prices both for power and light are made chiefly from motives of commercial expediency to obtain business which cannot otherwise be secured. To the extent to which such business is strictly competitive it is able to take care of itself and needs no help from this Board. Substantially all who pay the maximum price, and the city with respect to its street lights, must buy of the company or go without electricity, and they are entitled to invoke and to receive the utmost consideration of the Board." This holding is interesting, recognizing, as it does, the value of the service as a factor in rate-making.

NEW YORK.

The Western New York Telephone Company was authorized to construct lines and exercise franchises in the towns of Ellery and Bemus Point and the village of Chautauqua.

OHIO.

Telephone Merger. The Commission has approved the merger of the 15 independent companies to form the new corporation, The Ohio State Telephone Company. The companies in the merger are The United States Telephone Company, Cuyahoga Telephone Company, Columbus Citizens' Telephone Company, Toledo Home Telephone Company, Dayton Home Telephone Company, Washington Home Telephone Company, London Home Telephone Company, Stark County Telephone Company, Youngstown Telephone Company, Columbiana County Telephone Company, Zanesville Telephone & Telegraph Company, Findlay Home Telephone Company, Lancaster Telephone Company, Massillon Telephone Company, Citizens Telephone & Message Company (Fostoria.)

The rates charged by the several companies are to remain in effect subject to review by the Commission. Following its order authorizing the merger, the commission authorized the company to issue not exceeding $5,206,000 common stock, not exceeding $4,850,000 preferred stock, and not exceeding $5,000,000 Series B. bonds, which are to bear three per cent the first two years, 4 per cent the third year, and thereafter 5 per cent interest. $3,500,000 worth of these bonds are to be sold for not less than 80. $500,000 of the proceeds are to be used with the stocks authorized, to retire the stocks and obligations of the constituent companies, and the remaining $2,350,000 is to be spent for improvements and additions.

The Central District Telephone Company was authorized to form connection and interchange service with the Freeport Home Telephone Company. This connection will give the residents of Harrison Count- long-distance service.

OKLAHOMA.

The Sixth Annual Report of the Corporation Commission, exclusive of statistical information, has been filed with the Governor. Among the recommendations to the legislature, the Commission asks that a law be enacted conferring jurisdiction upon the Commission to regulate and limit the amount of stock and bond issues for all public utilities whose property is wholly within the state.

WISCONSIN.

Duplication of Lines. Application was made by certain persons in the town of Addison, Washington County, for a certificate of necessity and convenience to build a telephone line to connect with the Hartford Rural Telephone Company. Objection to the proposed line was offered by the Allenton-Kohlville Telephone Company, which company claimed that their line passed the residences of most of the applicants.

The Commission decided that the certificate should be granted because the evidence showed that the social and business interests of the applicants was at Hartford which could be reached conveniently only by the Hartford Rural Telephone Company. The commission's decision also indicates that the basis of its action is the impracticability of a physical connection between the lines of the applicant and objector. The decision says: "In border territory like that involved in this case, there is sometimes presented a situation where some overlapping of telephone lines is required in order that public convenience and necessity with regard to telephone service may be fully satisfied. While much overlapping may at times do some injury to one of the companies, and the general policy of the law is usually against the duplication of lines, which will impair investment, still it is also true that the convenience and necessity of the public itself in the matter of telephone service is the paramount consideration, and where the public need can only be satisfied by permitting a certain amount of overlapping, the doctrine of protection for existing interest cannot be carried to its full length." It is stated that the case shall not be used as a precedent but simply as a solution for the local conditions in the telephone service in Washington County.

Random Lake Telephone Company. The Commission denied the application of the Random Lake Telephone Company for authority to extend its lines in the town of Sherman, Sheboygan County. The East Valley Telephone Company whose lines would be paralled by the proposed extension entered objections. The proper solution, the commission points out, is a physical connection.

The Young America Light and Milling Company was authorized to issue $11,500 of stock. The issue to the extent of 10,000 was for the purpose of buying a power house, water power, dam and real estate situated in Young America, Washington County, Wis. The proceeds of the balance of the issue were to be used in purchasing additional machinery and equipment.

The Ludington Telephone Company was authorized to issue $605 of stock, the proceeds to be used in making extensions and additions to the plant. In a separate order the commission also authorized the company to issue $995 of stock, the purpose of the latter issue being to bring the sum of the capital stock and outstanding indebtedness of the company up to the value of its property.

The Park Falls Water Light & Power Company was authorized to issue $5,000 of bonds to reimburse it for funds expended from its depreciation funds on account of new construction extension and improvements, and also for working capital.

The Bismark Telephone Company was authorized to issue $1,600.00 of stock, the same to be substituted for a similar amount of void stock issued in ignorance of the stock and bond law. The Commission found that stock originally issued was for the purpose of making necessary extensions and improvements.

Large Electric Crane for Japan.

A 50-ton electric crane costing $50,000 has been ordered to be installed at the customs quay in Yokohama, Japan. With the exception of those at shipbuilding yards the new crane will be the most powerful in any Japanese port.

Copper Stock and Price Variations.

The large amounts of copper consumed in the electrical engineering industries and the rapid changes that occur in the price of the metal, render it desirable that all connected with the commercial and business side of these industries should keep a close watch upon the movements of stocks and prices in the copper market.

In this connection J. B. C. Kershaw, a well known contributor in the past to the pages of this journal, has prepared a graphic analysis with notes, showing in a clear manner the connection between the stock and price variations, of the preceding twelve months. Mr. Kershaw has been a close student of the statistics of the copper industry for many years, and is in touch with some of the leading copper buyers on the European side of the Atlantic.

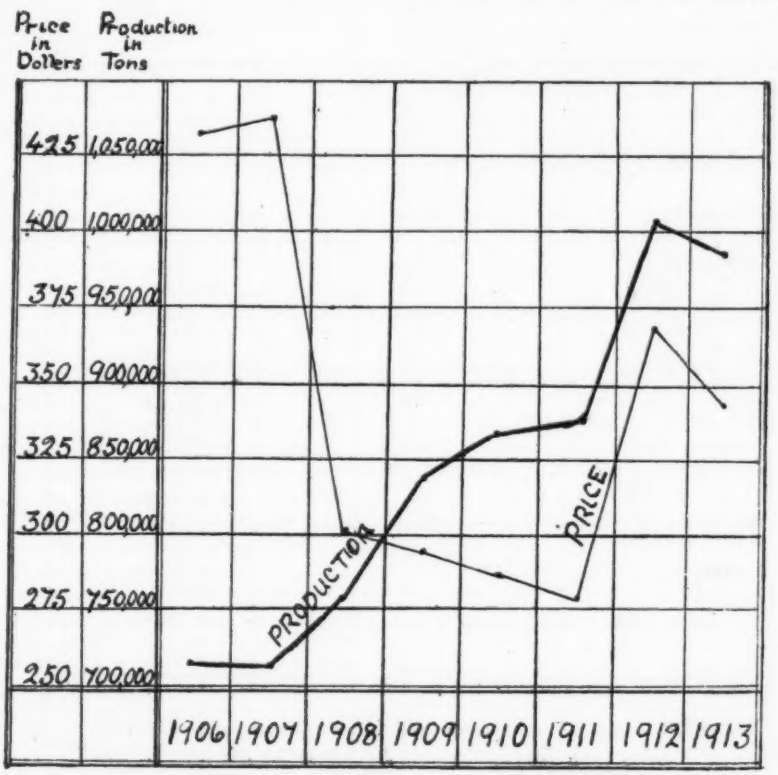


Fig. 1.—Production and Price Curves of Copper, 1906-1913.

The data used in constructing the diagrams, is the most reliable that can be obtained and include both the American and European figures for stocks in the refineries and warehouses, and also in course of transshipment.

Mr. Kershaw claims, that by a study of the stock and price curves, it is possible to forecast the price movements of the copper market for one or more months ahead, and that the up-to-date electrical engineer who uses

such diagrams and notes, will be saved from making bad bargains in his purchase of the metal.

Fig. 1 shows the production and price curves for standard copper during the period 1906-1913. The production curve is based on the figures given in H. R. Merton & Co.'s annual statistical circulars showing the copper production of all the countries of the world. The price curve is based on the average price of standard copper on the first of each month, in London; this average being likewise taken from H. R. Merton's annual circulars. and are reliable. The stocks include the quantity of copper in American producers' hands (as published by the American Producers' Association), and the stocks in Europe, with the quantities in course of transshipment thereto, from Australia and Chili. The prices are the settlement prices of standard copper in London on the dates recorded.

The severe fall in price which marked the closing months of 1913 has not yet been permanently checked, and a further decline in copper values, due to the increasing stocks of metal in

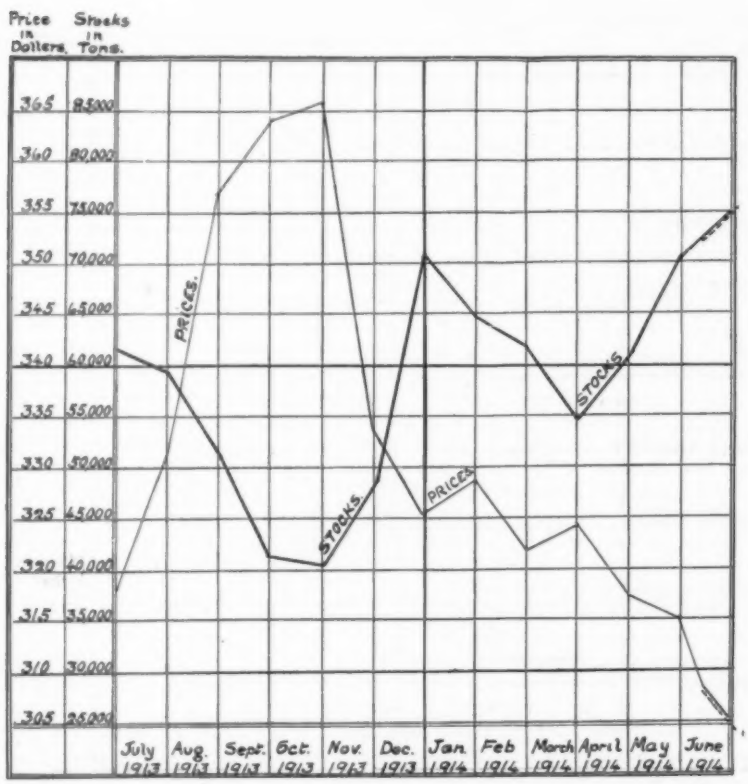


Fig. 2.—Variation in Stocks and Prices of Standard Copper From July, 1913, to June, 1914.

The notable features of the diagram are *that a rapid rise in the production curve, synchronises or is followed, by a dip in the price curve and that a period of slackening in the output of copper, leads up to a recovery in price.* Thus in the years 1906-1909 the output of copper was increased by 130,000 tons, and a sharp fall occurred in price. The years 1910-1911 were marked by an almost stationary output, and the rise in values in the two following years 1911-1912, was directly due to this slackening off in the rate of production.

Fig. 2 shows the variations in the stocks and prices of standard copper for the period July, 1913 to June, 1914. The curves are based on the figures given in Merton's monthly circulars, the American and European producers' refineries and warehouses, is indicated. The upward trend of the curve for stocks, which commenced in April, will most probably continue through the summer. A further fall in the price of the metal is therefore likely to occur.

Farmington Plant to Buy Power.

The Farmington Light & Power Company, of Farmington, Minn., has entered into a contract with the Consumers Power Company of Minnesota, for its electrical energy supply. The Farmington concern will dispose of its present plant as soon as the Consumers' line to Farmington is completed. Farmington's population in 1910 was 1,024.

THE INDETERMINATE FRANCHISE OR PERMIT.[1]

By Halford Erickson.[2]

As this subject is so comprehensive that even its most important features cannot be adequately covered in one paper, it seemed best to confine this discussion to some of the more essential features of the indeterminate franchise as it obtains in Wisconsin.

The statutes or laws in Wisconsin, under which the indeterminate franchise, or as it is called there indeterminate permit, operates, are a part of the so-called public utility laws of the state. In form this permit is simply a franchise grant, or permit, to carry on the business of a public utility, which permit issues from the state through the municipality where the utility is to be operated.

The indeterminate permit is in fact the right to occupy the streets and highways for the purpose of furnishing the public with needed service for compensation, subject to the provisions of the public-utility laws of the state, including those which provide that the utility at fair price may be taken over or purchased by the municipality, and that when public convenience and necessity require it, the Commission, charged with the administration of the public-utility laws may authorize another or a competing utility to enter the field and furnish like or similar service. Until such competition is so authorized, however, the permit or franchise thus obtained is exclusive in its nature.

The Wisconsin indeterminate permit may be said to be the outcome of the efforts that had been made from time to time to find some franchise or permit for public utilities to operate under that would go further in protecting public interest and in stimulating private initiative than any of the existing franchises. At the time the public-utility and indeterminate-permit laws were enacted, the franchises in effect varied from the perpetual franchise without restrictions to the short-term franchise with all sorts of restrictions. The working of these franchises had gradually developed the conviction that they were out of harmony with the nature and purpose of public utilities. Such utilities for instance are not subject to the ordinary laws of competition and public interests therefore require that some other regulating force be substituted for active competition. Their equipment usually has to occupy crowded streets, alleys and highways in which the conditions are such that nothing can be safely left to take its own course. They furnish service which public welfare demands should be continuous, uninterrupted and adequate, and which should also be supplied at the low-

1 Portion of an address before the Ohio Electric Light Association at Cedar Point, July 24, 1914.

2 Member of Railroad Commission of Wisconsin.

est reasonable cost. Such utilities, therefore, should not be burdened with competition that involves more in the way of an investment in the entire service than the amount actually necessary to that end under the most economical and effective system of operation; nor should they be loaded down with special taxes or charges of various kinds that tend to cause unnecessary and unwise increases in the cost of the service and to lower its quality.

History of Indeterminate-Permit Law.

While Wisconsin appears to be about the first state in the union that has adopted the indeterminate permit as outlined herein for general use, many of the more important principles involved in such permits appear to have prevailed in Massachusetts, the District of Columbia, and other places previously to their adoption in Wisconsin. The first law in Wisconsin upon this subject in 1907, provided that all franchises, grants or permits granted after the law went into effect to any telephone company or to any corporation or association desiring to supply heat, light, water or power to the public, should have the effect of an indeterminate permit. Another section specified how an existing franchise might be changed to an indeterminate permit.

The law provides that any public utility accepting or operating under any license, permit or franchise hereafter granted shall be deemed to have waived the right to have a jury determine the value of its property in case a municipality in which it operates desires to take it over.

For nearly four years after the indeterminate permit had been provided as a substitute for the ordinary utility franchise it was left optional with utilities operating under franchises to surrender their grants and substitute therefor the new grant, or to retain their existing franchises. In 1911, however, the legislature decreed that all franchises coming under the provisions of the utility law of 1907 and not yet changed should become and have the same effect as indeterminate permits. The law of 1911 changing all existing utility franchises coming under the provision of the utility law of 1907 into indeterminate permits created a lack of uniformity in the franchise status of utilities. Those utilities which received their first permits after July 1, 1907, when the utility law went into effect, and those which between July 11, 1907 and January 1, 1911 voluntarily surrendered their franchises and took in place of them indeterminate permits, by doing so are deemed to have consented to a future purchase of their property by their respective municipalities, and to have waived the right of requiring the necessity of such purchase to be established by the verdict of a jury. As to these utilities the municipality is given the power to determine by vote to purchase and take over at a valuation fixed by the Commission. The Commission's power here is wholly subordinate to that of the municipality. The latter has but to notify the Commission that it has decided to take over he utility and the Commission must proceed to place a valuation upon the property. At any time a city becomes dissatisfied with the service or rates charged, or with the utility's method of carrying on its business; or whether there be no dissatisfaction, but in place of it a desire for municipal ownership, the power lies with the city to take over the utility independent of the Commission except as to valuation by the latter. The valuation placed upon the plant by the Commission stands as the amount to be paid by the city, unless on an appeal to the courts the latter should decide that the Commission's valuation was unreasonable.

As to those utilities which had not surrendered their franchises prior to January 1, 1911, and whose franchises were changed into indeterminate permits by the law of 1911, the municipalities cannot take them over on a valuation fixed by the Commission until the necessity for such taking over has been determined by a jury or unless the utility waives its right to such determination. We have had cases where the utilities which the municipality desired to take over and which had not voluntarily accepted the indeterminate permit, did specifically waive these rights and were valued by the Commission and taken over by the municipality.

It may be said here that the Legislature of Wisconsin never lacked the power to regulate local utilities. By a constitutional reservation of power it could amend or revoke the franchise of any public service corporation at any time. It was this power which enabled the state to transform by legislative act in 1911 all utility franchises which had not been exchanged for the new grant into indeterminate permits.

In communities where there is no existing utility, the method of obtaining an indeterminate permit is simple and direct. When an individual or association of individuals or a corporation desires to engage in the public-utility business and there is no other enterprise supplying the same service, application is made to the municipality in which the major portion of the business is to be carried on, for the privilege of using the streets, etc. When this application is granted by the municipality, it becomes by operation of law an indeterminate permit subject to all the provisions of the public-utilities law.

The situation is different if there is already in existence a utility rendering the service which the new enterprise contemplates furnishing. The application for a permit must then be made directly to the Railroad Commission for a certificate of "convenience and necessity." At this point the Commission as the agent of the Legislature exercises its highest power. It may grant the certificate if sufficient grounds for doing so are presented, and thus destroy the exclusive privilege of the existing utility. In addition to such certificate the grantee must also obtain a permit from the municipality to use its streets and alleys for the purpose of furnishing the service. Such certificates are not likely to be granted by the Commission except in cases where the existing utility either cannot or will not furnish adequate service under reasonable conditions. While the granting of a certificate of public convenience and necessity may involve momentous results, its effects being nearly if not quite the equivalent of the revocation or amendment of the franchise, such grants are surrendered by so many safeguards that the powers involved cannot readily be abused.

Why the Indeterminate-Permit Law was Enacted.

When these laws were enacted many objections were raised against both the perpetual and the short-term franchises. Much was also said both for and against the indeterminate permit.

Against perpetual franchises with their lack of restrictions it was among other things said that, while under them liberal investments were often made in the plant, they gave the utilities more power than they could safely be intrusted with, and that this in turn operated as a barrier to such readjustments of rates and rearrangements of the service as are frequently necessary in growing communities; that since they represented valuable rights they often lead to excessive capitalization; that they also prevented such changes in the management and operation as are needed from time to time in order that utilities may be made to promote the welfare of the public; and that for these and other reasons they were in principle as well as in operation out of line with public interests.

Against the short-term franchise and its many restrictions it was, among other things, urged that owing to the uncertainties as to what would happen at the end of the franchise period the utilities were not only unwilling to make necessary extensions of the plants, but were often unable to obtain capital for such extensions; that since the franchise terminated before long it was necessary either to amortize the cost of the plant and the extensions, which meant very high rates and poor service, or to give assurance that the franchise would be renewed at the end of its life, which made it partake of many of the objections of the perpetual franchise; that such amortization provisions and assurances were so operating as *not* to relieve the utilities from the necessity of feeling that unless they made as much money as possible during the life of the franchise there would be many losses to bear at its expiration; and that this resulted in letting the equipment run down until towards the end of the franchise it could not perform adequate service; that for must communities the future needs and conditions are

so hidden that they can not be correctly foreseen even a short time in advance and that for these reasons the restrictions even in the short-term franchises are more than likely to become unfair to one side or the other long before their expiration; that all this in connection with many other facts and conditions had had a marked tendency to retard the development of the community, to disturb investment and business conditions generally, to lead to all sorts of political intrigues, dickerings and betrayals, and to result in loose methods of operations and accounting, and the shirking of many just obligations.

These and other objections to the perpetual and the short-term franchises, it was held, would be overcome by a franchise or permit which permitted operation until the utility was taken over by the municipality for a fair compensation for the property and business involved and which permit also was an exclusive permit until public convenience and necessity demanded that another utility performing like service be permitted to enter the field and under which permit also the utilities would be subject to such state regulation as was provided by the so-called public utility law proposed and enacted at the same time and of which it was a part. A franchise or permit of this kind when taken in connection with the public-utility law was held to be in harmony with the nature of the utility business and to be fair and just to all concerned.

Among the factors under the indeterminate permit which tend to protect the public and to promote its convenience and welfare the following may be mentioned:

(1) The public is entitled to adequate service at reasonable rates that are free from unjust discriminations.

(2) Since the municipality has the power to grant or withhold the use of its streets and highways for public-utility purposes, it may also where no utility exists and where a certificate of public convenience and necessity has been granted, either reject or accept applications for such use; and through the exercise of this power it is in position to largely control the situation in the interest of the public.

(3) The municipality has been granted the power to acquire at a fair price the property and business of the utilities by which it is served and can exercise this power and enter the public utility business whenever it chooses to do so, or whenever it becomes dissatisfied with either the service or the rates, or with any other condition.

(4) Whenever public convenience and necessity demand it, the municipality or some other utility can obtain authority to enter the field and to furnish service in competition with the existing utility.

Among the factors which tend to increase the safety of the investment and promote fair treatment of the enterpriser under the indeterminate permit are the following:

(1) The utilities for adequate service are entitled to rates that are reasonable under the circumstances.

(2) The utilities are entitled to fair prices for the property that is used for the convenience of the public when it is taken over by the municipality.

(3) Except where active competition existed when the public-utility and indeterminate-permit laws went into effect, the utilities are entitled to the exclusive right to furnish the service until the property is taken over by the municipality or until for good reasons a competitor is authorized to enter the field.

(4) Public utilities are entitled to have all investments made for the benefit of the public kept intact through proper depreciation charges included in the rates for the service rendered. As an offset to the loss of speculative profits that are caused by regulation they should as far as possible be protected from losses that have their source in active competition.

In connection with the factors just explained, consideration should also be given to the following propositions:

(1) What constitutes adequate service is determined by standards and rules developed through careful investigations and wide experience and which standards and rules are enforced by regular inspections and other methods and proceedings.

(2) Reasonable rates under normal conditions are made up of charges that are high enough to cover fair returns for the operating expenses including depreciation and interest, and profit on the fair value of the property and business involved.

(3) In determining the fair value of the plants and their business, consideration when possible is given not only to the cost of reproduction, but the original cost of such plant and business, together with other factors that may affect the value.

(4) The power to authorize a competitor to enter the field under a certificate of convenience and necessity is exercised with the greatest care and with the most scrupulous regard for all the interests that are affected. Such certificates are not granted until it has been clearly established that public convenience and necessity demand such action. In passing upon such matters the inability or unwillingness to render adequate service, and other questions that vitally affect the public welfare, rather than local frictions, political interests and untried and uncertain governmental experiments are the controling factors. The burden of proving that such competition is necessary and to the best interest of the public is also largely upon those who make such application. In addition to this the merits of such applications are carefully inquired into by the Commission. With the adequate power which the Commission has, not only for ascertaining the true situation but for compelling the existing utilities to furnish adequate service and to so carry on their business as to promote the general welfare, it is clear that it is not often necessary to grant such certificates.

(5) The power to permit competition when needed is regarded as of almost as great importance as the power to revoke franchises, a power that rests exclusively in the Legislature. It is also a fact that such competition, if authorized, would under the circumstances be almost certain to spell ruin to the existing utility. When the existing utility, however, can be made to serve the public as well and at as low cost as any service that could be obtained from any other source, then it would manifestly be unjust as well as a waste of capital and efforts to authorize competition. The power to authorize competition, however, has considerable value as a regulative force.

When the law of 1911 changing all public-utility franchises into indeterminate permits that had not up to that time been voluntarily surrendered for such permits, it was found that about 60 per cent of the utilities in the state were affected thereby. The reasons why not more than about 40 per cent had voluntarily accepted the indeterminate permit are several. Many utilities had perpetual and long-term franchises that were comparatively free from restrictions. In other cases again the relation between the bond issues and the existing franchise were such as to make the advisability of the change uncertain if not wholly impracticable.

There were also many who were delaying the change until they could obtain more light on the results of the operations under the indeterminate permit and as to whether the new franchise policy which had thus been adopted by the state would be permanent.

Many also felt that the indeterminate permit would not take the utilities out of politics and that for this reason they would be little or no better off under the indeterminate permit than they were under the existing franchises.

Some Objections Raised to Indeterminate Permit.

Certain objections have of late been raised against both indeterminate permit, the public convenience and necessity and other provisions in the Wisconsin public-utility law. These objections cover a good deal of ground, ranging from the monopoly features of these laws to their effect upon local regulation and municipal ownership.

Monopoly Features.—It is true that the permit in question is often referred to as creating a monopoly, but is this conception of it correct? The Wisconsin Supreme Court in its decisions has pointed out that the indeterminate permit does not

have the characteristics of a monopoly, as that word is commonly understood, because its exclusiveness is not something which the utility gets without consideration. Nor is it an exclusive privilege of rights previously common.

An examination of the provisions of the utility law will disclose that the substitution of the indeterminate permit for the local franchise theretofore existing, while it operates to give to the utility certain rights not before enjoyed, likewise operates to exact an equivalent therefor from the utility.

The municipality and the utility surrender such advantages, if any, as might have accrued to either from conditions inhering in the local franchise, and thereby lose the benefit of any contractual obligations inhering in such franchise to which either was theretofore entitled. The municipality in a measure may perhaps be said to have surrendered such control over the service, rates and other conditions as it may have had under the franchise for the provisions of the public-utility laws. The utility for the limited and perhaps nonexclusive franchise receives an exclusive franchise indeterminate as to time. In consideration of this it not only surrenders such advantages as it may have had under the displaced franchise, but it becomes bound to sell to the municipality its property for the compensation and on the conditions fixed by the Railroad Commission. In addition to this it also has to accept competition when this is deemed necessary and to become bound by a broad and complete system of regulation as to services, rates and other conditions.

While the indeterminate permit is said to be an exclusive privilege, it is not so in fact; for as pointed out already, the law empowers the Commission to permit the operation of a competing utility at any time after it appears upon hearing and investigation that public convenience and necessity requires such second utility. When, therefore, the existing utility, through bad management, or for some other reason, fails or is unable to furnish adequate service at reasonable rates, and when for these reasons public convenience and necessity requires another utility, the law provides a way in which the situation may be relieved. The indeterminate-permit and public-utility laws, therefore, afford the existing utility an exclusive privilege to furnish service for compensation only so long as this service is adequate and the charges therefor reasonable.

The law thus accomplishes the prevention of economic waste, and security of investment, and at the same time preserves to the public adequacy of service and reasonableness of rates.

It is now generally recognized in economics that in the public-utility field regulated monopoly is better for the public than unregulated competition. This policy has also been consistently adhered to by the people of Wisconsin since the public-utility law was enacted in 1907 and even prior to that time.

In connection with the applications for certificates of convenience and necessity that have come before the Wisconsin Commission, I have often had occasion to investigate the effect upon the existing utility and customers, as well as upon the municipality, of dividing up its business with an additional plant. In these investigations I have almost invariably found that such a division of the business would have greatly reduced the net earnings of the existing plant, while at the same time it would have seriously increased the cost per unit of service to the public. Time will not permit me to go into details. But in one case where the city officials desired to erect a municipal plant for the purpose of lighting its streets and public buildings, it was found that the granting of this application would have decreased the revenues of the existing company by considerably more than twice as much as it would have decreased its expenses; that it would have caused an increase of about 15 per cent in the cost to the city of the street and other public lighting; that it would have increased the cost per kilowatt-hour to private lighting and power users of the city by nearly 20 per cent; and that these increases in the costs were far reaching enough so that under rates that were high enough to cover them it would have been impossible to expand the electrical business or even to retain all of the business the existing plant then had. To have granted the certificate under such conditions could hardly have been in line with public policy. And yet because the certificate was not granted, the Commission has been bitterly criticised not only by local interests but by persons outside of the state.

(To be continued.)

Electric Show at Tennessee State Fair.

As one of the attractions at the Tennessee State Fair in Nashville, September 21-26, there will be an electrical exposition under the auspices of the Jovian League of that city. This show will occupy the entire first floor of the Agricultural Building, which will be especially illuminated inside and outside for the occasion.

Many of the largest manufacturers in the country have negotiated for space in the exposition, and there will be also displays and demonstrations of electrical appliances in the exhibits of Nashville dealers. The educational side of the show will include wireless apparatus—a station will be in operation for the period of the Fair—views of the Panama Canal, etc.

The Artificial Illumination of Factories.

Among all the government documents published in England in the course of a year the most human is that in which the chief inspector of factories and his staff detail the conditions under which they have found workers engaged following their various occupations. But the value of these reports is greatly increased by the observations of these experienced men and women inspectors on the steps which are being taken or ought to be adopted in removing the causes of accident and complaint when these arise. The growth of electrical application, the adoption of more up-to-date methods of illumination and ventilation, as well as the manifold means and devices necessary or actually employed to prevent mishap to the artisan, and lessons drawn from selected accidents, come under expert notice for the edification and instruction of both the "social reformer" and the engineer.

It is shown that the increased use of electricity as a motive power was not less remarkable during 1913 than in previous years, and that it was noticeable in all parts of the country. It is especially commented upon in Scotland "where the strenuous efforts made by the town councils to get traders to adopt this form of power have resulted in many small joiners, tailors, watchmakers, bootmakers and others putting in electric motors, even in places where only two or three hands are employed."

In regard to the lighting of factories and workshops a special Departmental Committee is still investigating this subject. As the matter is therefore to some extent *sub judice* no very active steps have lately been taken by government inspectors. It formed one of the topics discussed at the iron-foundries conference, where proposals were advanced for standardizing both national and artificial lighting. As regards the former it was suggested that there ought to be a minimum relation between window and floor area, and a proportion of 1:4 was proposed.

A special investigation by D. R. Wilson made it appear to be possible from the data collected to draw a fairly clear line between efficient and non-efficient lighting. His conclusions were therefore embodied in the following proposal: "No foundry shall be deemed to be adequately lighted unless the illumination intensity, measured on a horizontal plane one foot above the floor level, does not fall below 0.3—0.4 foot-candles over any part in which work is being carried on, or over which any person is liable to pass." After exhaustive discussion of this proposal, further consideration was left to the Departmental Committee, which would conduct a wider investigation.

Though no definite results were arrived at there was general agreement among those present as to the importance of good lighting. It was important from three points of view: (1) safety; (2) output; and (3) eyesight.

In regard to safety, the report says it is well nigh impossible to produce statistics to show the effect of lighting on the accident rate, but the proposition that a well lighted foundry is a safer place to work in than a badly lighted one was generally accepted at the conference.

In regard to output, it could hardly be disputed that more work and better work was produced under good lighting conditions. On this aspect of the case Inspector H. J. Wilson, of Glasgow, reports:

"There is no doubt whatever that a highly intelligent interest is being taken in improved lighting of industrial premises. I am told that improvement in lighting pays the manufacturer, and as this becomes recognized little encouragement is necessary to persuade employers to adopt an efficient system of illumination. Two large shipbuilding firms have entirely remodeled their lighting at considerable cost both for inside and outside work."

Respecting the comfort and eyesight of the workers it is stated that it is on this point that guidance is perhaps most needed. Mr. Solloway, Manchester, an inspector, mentions a particularly bad case of apparent eye-strain through defective lighting of a cotton-reeling workshop. "This was partly underground and had windows on one side only. Except on very bright days gas was used for lighting nearly continuously, and exactly 50 per cent of the workers employed on the row of frames farthest from the window wore glasses, whilst on the row nearest the window only 5 per cent wore them. The occupier treated the fact as a mere coincidence, but it appeared a possible case of cause and effect."

Among the experiences of other inspectors is one given by Mr. Shaxby, of Yeovil, as follows:

"An engineer's drawing office provided a demonstration of the great value of appropriate shades. All but one of the pendant electric bulbs happened to be fitted with more or less parabolic metal shades (painted green outside and aluminum inside). The glare from the unprotected bulb was very noticeable amongst the other lights, whilst the board beneath it appeared to be only about half as brightly lit as the boards under the shaded bulbs."

From some parts of the country there were complaints of cold work rooms. In some places the insurance companies either prohibit the use of coal fires or fix prohibitive premiums; in many basements there are no chimneys at all and there are obvious difficulties in carrying a ventilating flue from a stove through the upper floors or out at the street level. The report suggestively adds here:

"Possibly the solution of the difficulty is to be found in the adoption of a new, cheap and efficient electric radiator; at present the occupier falls back too frequently upon the flueless gas stove, often on the advice of the gas companies who provide them . . . There seems to be an ever recurring supply of new installations of this kind which require attention."

British Marconi Wireless.

Great disappointment and surprise were expressed in England when the report of Marconi's Wireless Telegraph Company Limited appeared on July 13. The net profit for 1913, at $612,000 is very much less than that for 1912, when "substantial profit" was realized "under exceptional circumstances." The dividends paid are at the same rate —20 per cent and 17 per cent on the two classes of shares—but whereas for 1912, $500,000 was put to reserve, nothing is so placed for 1913, and the carry forward is only $382,750 which is only half of the amount brought forward. Seeing that this year there has been a large increase of capital which will rank for dividend in the current year, the feeling of the London press and stock exchange will be understood.

The report as usual contains a full summary of the technical achievements or expectations of the company and its associated or subsidiary concern.

The Goldschmidt high-frequency alternator in which the company is interested has been erected at a station in Germany and at another near New York. Experimental work is being conducted between the two stations. It is yet too early to speak definitely as to the results. A demonstration has been given of the transmission of 3,000 words from America to Germany, when conditions were favorable, but tests from Germany to America on a similar scale have not yet been made. Given that they prove sufficiently promising, work will be proceeded with immediately with a view to making necessary changes and additions to equip both stations on a commercial basis. Some months, however, must be allowed for this work to be completed.

The erection of the high-power station for the Norwegian Government is well advanced and should be completed by the autumn. A commercial telegraph service between Northern Europe and the United States of America is to be inaugurated, in which the Company will be interested to the extent of 10 per cent of its gross receipts.

Licenses have been obtained from the British and Spanish Governments for a direct wireless service between the two countries. For this purpose the station at Poldhu has been enlarged, and a service to Spain and the Canary Islands will be inaugurated within a few weeks.

Exceptional weather causing considerable difficulty and delay in transport of plant has caused the high-power stations in the United States to be longer in course of erection than was contemplated. Those, however, of San Francisco, Hawaii and Belmar (New York), are now practically complete, and will soon be opened for service.

Improvements have been made in some of the types of field station apparatus, notably the lightest form of military apparatus, known as the Knapsack station, which has been entirely re-designed. The sales for 1913 are more than double those of the previous year, and during the early part of 1914 important orders have been received from foreign Governments.

Rapid progress has been made in the development of wireless telephone apparatus, and the company has recently introduced a practical and commercial set for moderate distances. Further important developments are proceeding and it is contemplated that apparatus will shortly be available for the transmission of speech over considerable distances.

Marked progress has been made during the past year in the development of the wireless compass, or direction-finder, and fog and submarine signaling apparatus. These instruments should add materially to the safety of life at sea. An apparatus for use in lifeboats has also been recently introduced on the market.

Hydroelectric Development in Colorado.

The Western slope of Colorado from Durango north to Grand Junction is to be gridironed with hydroelectric power lines for the development of that section of the state as a result of a consolidation of a number of Colorado companies, according to information given out recently. The Western Colorado Power Company, the Colorado division of the Utah Power & Light Company has taken over in fee simple the plants of the Ouray Electric Light & Power Company, the Montrose Electric Light & Power Company and the companies operating at Ridgway and Delta. These are to be connected with the plants formerly belonging to the Telluride Power Company, the San Juan Water & Power Company, the Durango Gas & Electric Company, and the Telluride Electric Light Company, all of which are owned by the Western Colorado Power Company.

Ohio Electric Light Association.

Twentieth Annual Convention, Cedar Point, July 21-24.

The twentieth annual convention of the Ohio Electric Light Association was held, as has become customary, at the Breakers Hotel, Cedar Point, O., and added another to the long series of successful conventions held by this association.

The first session was called to order at 2:30 p. m. on Tuesday by President J. C. Martin, who made the usual presidential address covering the work of the Association for the year. Capital for utility extensions has been scarce not only on account of the general business depression, he said, but on account of the antagonism shown toward the utilities in the state and the agitation for the home-rule policy for the cities of Ohio. The latter is a backward step, since state regulation is superior to local control. He pointed out the fallacies involved in the home-rule policy, and in municipal ownership of utilities. Development, which is so essential to progress and to the welfare of all is held back by the lack of capital which is kept away. The legislative sessions held during the year had been marked by antagonism toward the utilities. The Mills bill, removing limitations to the bond issues of municipalities, had, however, been amended so as to be harmless. The Bucyrus case, before the Public Utilities Commission, involved important principles of valuation, but the Commission has not laid down rigid rules on this subject. The rate of return is yet to be fixed, and the case will come up on August 11. The Commission has issued Order No. 176 providing for the valuation of all utility properties in the state. This led to a special meeting of the Association at Columbus on May 6 and the appointment of committees on appraisal and on uniform accounting. The latter is working in co-operation with the accountant of the Commission. When accounting methods are adopted by the Commission, they must be followed by municipal as well as private plants, and this will permit an accurate comparison of the two. He then referred to the establishment of the *Association Monthly*, the fact that it is self-supporting and the detailed arrangements for the convention.

The report of the secretary-treasurer was then presented by D. L. Gaskill. It showed a balance in the treasury of $438, with accounts receivable unpaid of over $1,000. There has been a net profit so far from the publication of the *Association Monthly* of over $500. He proposed the formation of an Editorial Committee to pass upon questions of policy which come up. The membership of the Association has increased since last year. The work of President Martin was highly praised.

This report was received and referred to the Finance Committee for audit.

There were no written reports submitted by the Executive Committee or the Advisory Committee.

Insurance.

For the Committee on Insurance, Mr. Gaskill reported that the Committee had endeavored to secure reductions in the fire-insurance rates, but without much success, although a small reduction had been secured for certain classes. The Committee recommended interinsurance as a method of relief from the outrageously high rates. There is work ahead with respect to liability awards. The State Industrial Commission has fixed the liability rate at $3.10 per $100 of payroll except for the office force, where the rate is 25 cents.

President Martin referred to the work done with the Insurance Committee of the State Legislature, and then called on Lynton Block, of the Utilities Indemnity Exchange, to explain interinsurance.

Mr. Block pointed out the advantages in interinsurance, which has been taken up by a number of industries with the result of considerable savings in insurance premiums. These savings are due to the elimination of agents' commissions, reduction of managing expenses, the elimination of profit and the exclusion of the undesirable business which is frequently secured by local agents. The customary saving is about 40 per cent. Interinsurance differs from mutual insurance in that the original premium represents the maximum payment, there being no assessments. Any surplus is returned to the policy-holders and not to stockholders. In answer to questions he stated that fire-insurance premiums vary from 50 cents to $5.00, according to the risk and that $1.50 may be taken as an average value for a good brick building. D. L. Gaskill pointed out that the rates in Ohio were not scientifically determined and gave figures for the loss in premiums showing the enormous discrepancies between the two.

L. K. Funkhouser told of the experience of the Dayton Power and Light Company, which had secured very low rates by paying attention to fireproofing and other points in the construction which influenced the regular companies in fixing the premium. The best way to go about doing this is to secure from the inspection bureau a statement of the conditions for a low rate, since the rate is determined by taking a base rate for the industry, which in this case is 58 cents, and adding to or deducting from this in accordance with the details of the particular plant. It is well to discover what the deficiency charges are due to and see whether it will not pay to eliminate them. The Dayton rates have been cut in two by this procedure.

G. E. Miller objected to the possibility of an insurance company repudiating its contract at any time and said that there should be a state law which would make an insurance contract binding until its expiration.

J. C. Martin pointed out how the insurance business was controlled by the rating bureaus, which in Ohio are three in number, covering different sections of the state. These bureaus are paid by the companies to fix the rates and appear to be responsible to no one. He urged legislative action controlling insurance, which he thought needed regulation quite as much as public utilities. An insurance company that does not join in the support of the rating bureau is regarded as an outcast by the others and cannot place reinsurance.

The election of new members then took place, the membership list being increased by 17 active, 5 associate and 3 engineering members. At a later session two additional associate members were elected.

Illumination.

The report of the Committee on Illumination was then presented by S. E. Doane. This report covered principally four problems. The extension of service to the small consumer can be greatly furthered by the methods of wiring and charging for service used in Europe, as described in the report of the Committee on Wiring of Existing Buildings of the National Electric Light Association. These methods should be at once applied, as they not only enlarge the business but secure the good will of a large class. The lighting of country roads is the second method of extending service advocated by the committee. Existing pole lines should be utilized for mounting inexpensive fixtures, which should include an enameled reflector. A large number of small units should be supplied from transformers placed about 2,000 feet apart. With 40 poles to the mile, fixtures and lamps should cost only $100 per mile. The recent development of incandescent lamps was then referred to. Lamps of 400 to 1,000 watts at 110 volts have effi-

ciencies of 0.75 to 0.55 watt per candle. Series lamps are available from 60 watts up, with efficiencies from 0.8 to 0.5 watt per candle. To use 20-ampere lamps, compensators or transformers are usually necessary, and it is questionable whether the increased efficiency justifies the additional investment. The committee considers it inadvisable to make any investment of this kind which requires more than three years to pay for itself. Finally, standardization of voltage at 120 volts is advocated. This can be accomplished gradually by changing operating voltage a few volts each year.

In answer to questions by D. L. Gaskill, W. R. Power and O. H. Hutchings, Mr. Doane stated that there is no doubt that the type C Mazda lamp will entirely displace the present forms of arc lamp. With the constant reduction in current consumption, the efficiency of the lamp is becoming less important, since the cost of energy is already but a small part of the total cost of electric lighting. The first cost of the lamp and necessary equipment is of more importance. As the efficiency of the incandescent lamp has been improved, the rated wattage has been kept constant and the candlepower increased in the case of lamps for constant-potential circuits; whereas for street lighting the candlepower has been kept constant and the wattage reduced. He favored the latter practice and thought municipalities should pay for light rather than for current, since the energy consumption is a small part of the expense. He counseled making all contracts based on illumination. The life of the gas-filled lamp depends upon the efficiency at which it is operated and the manufacturers aim to make the life, 1,350 hours, which corresponds to three renewals per year in street lighting. Very soon all series lamps above 60 candlepower will be of the gas-filled type. Since the filament in this lamp is operated nearer to the melting point than in the older types, surges of current are more dangerous and will result in more burnouts. Trouble may arise when these lamps are operated in series with magnetite arc lamps, but by using them in connection with a compensator on all alternating-current cricuits, it will be impossible to have a destructive surge in the secondary circuit, even though one should occur in the primary. When making changes it is better to standardize upon a lamp taking a larger current, since the efficiency is better for larger current. Standardization in lamps would reduce the cost on account of the elimination of large overhead expense, such as the carrying of warehouse stocks, the working out of factory designs, etc. There would be considerable saving in cutting the number of standard sizes down to three, and still more by cutting to a single standard.

Henry Schroeder emphasized the value of standardizing the voltage of operation, as this would reduce the cost of manufacturing and hence the price of lamps. For series work it would be well to concentrate on the 6.6-ampere lamp. While the efficiency is better in the 20-ampere lamp, the investment cost is also higher.

W. S. Culver said that the central-station men were ready to co-operate in standardizing voltage when they are convinced that it will reduce the cost of lamps. He considered it easier to standardize on three separate voltages than upon a single one, and suggested 104, 112 and 120 volts. The saving in cost of lamps must be sufficient to balance the cost of changing.

Thomas F. Kelly sent in written discussion which was read by F. B. Steele. Service to small customers is often conducted at a loss. If the method of billing, metering, etc., can be changed so as to make these customers profitable, it would be a decided advantage. The Dayton company is supplying some rural road lighting, as suggested in the report; 75-watt lamps with radial-wave reflectors are mounted 140 feet apart. These will soon be replaced with 80-candlepower gas-filled lamps.

President Martin said that the Association should go on record with respect to standardization. Referring to street lighting he said that it is hard nowadays to get a contract for any long period and as equipment is usually obsolete by the time a contract comes up for renewal, it is proper to make the price sufficient to cover amortization within the contract period.

O. H. Hutchings suggested the apponitment of a committee to report on the standardization of voltage. Motion to do this was carried and the session then adjourned.

Meter Committee Report.

At the opening of the Wednesday morning session, the report of the Meter Committee was presented by A. H. Bryant. The commtitee has considered principally the problems of the smaller companies. Advances in meter practice must come through an understanding of underlying facts and conditions, realization of the relative importance of these, consideration of possibilities of improvement, study and application of ideals. Three conferences, attended in all by representatives of 42 operating companies, were held during the year at Cleveland, Toledo and Columbus. They dealt respectively with testing, records, and special problems of smaller companies. The committee feels that much benefit has been derived through these conferences, and recommended their continuance. It also recommended that the committee be continued by the appointment of one new member each year, the senior member to be chairman; that an appropriation be made for the traveling expenses of a representative (preferably an ex-chairman of the committee) to visit the member companies to study their conditions and needs; that a department of questions and answers on meter work be established in the Association *Monthly;* and that uniform reports of meter tests be compiled. Forms for recording and classifying test data were submitted with the suggestion that the Association supply them to member companies. This would foster a more careful and thorough analysis of data; emphasize the importance of systematic testing; place comparative data upon a uniform basis; and pave the way for adopting uniform tests, which would render action by the Public Utilities Commission unnecessary.

In opening the discussion, President Martin referred to the relation between meter registration and the standardization or changing of voltages. This aspect of the matter was discussed by S. E. Doane, F. H. Krauss, D. L. Gaskill and W. S. Culver. It was pointed out that raising the voltage would slightly increase the loss in the meter shunt circuit, but this would be much more than compensated by the increased revenue resulting from operation at a higher voltage. Messrs. Doane and Culver emphasized the advantage to the central station in keeping the voltage up to the nominal value as this caused better operation of apparatus, greater light from lamps, greater consumption of energy and consequently increased revenue. In the case of one company adjustment of this kind produced sufficient increase in revenue to permit a six-percent dividend where none had been possible before. This, however, is a separate question from the raising of the nominal system voltage.

Others discussing this report were F. C. Caldwell, G. E. Snider, John K. Himes, O. H. Hutchings, Weare Parsons and M. H. Wagner. Professor Caldwell considered the educational work of the committee the most important element in improving meters. Mr. Snider told what good has been accomplished by the meter conferences, especially in the territory around Toledo with which he was familiar. He thought a comparison of results of meter testing would be stimulating and the Toledo company was ready to do so. Co-operation is necessary for the

success of the proposal to have a meter man visit the small companies, and it was possible that some of them would not receive him cordially.

Secretary Gaskill told of the suggestion which had been made that a prize be offered by the Association for the meter department which showed the highest efficiency. While it was generally agreed that this might be a good idea it would be hard if not impossible to make a choice until some systematic method of reporting was put into practice. The Association is not quite ready for the establishment of such a prize. A motion was carried referring the recommendations of the Meter Committee to the Executive Committee with instructions to carry them out as far as possible.

In closing the discussion, Mr. Bryant stated that meter accuracy would not be affected by a change of six volts. The manufacturers claim that a 20-per-cent change in voltage does not affect the accuracy. He referred to the desirability of forestalling action by the Public Utilities Commission with respect to metering, as if it is necessary for the Commission to issue any orders in this respect, customers will think it is because the companies have not been treating them properly. The idea of a prize is a good one when the Association is ready for it, but it is necessary to first have uniform reports.

The secretary then read a telegram from J. M. Wakeman, general manager of the Society for Electrical Development, sending good wishes to the convention.

Transmission.

The report of the Electrical Transmission Committee was presented by M. H. Wagner. This report first considered the specifications of the Joint Committee on Overhead Line Construction, as adopted by the National Electric Light Association. These specifications seem to apply to ideal rather than practical conditions, and can seldom be followed. They should not be applied to 6,600-volt lines. The requirements for clearance, for guying and for length of spans adjoining crossing spans are not endorsed by this committee. Acquisition of right of way receives considerable attention. Alternative routes should be planned, and location finally made where farmers are progressive and realize value of having electric energy available. This will reduce cost, bring business and make negotations easier. The deterioration of insulators is considered. Design, composition and firing of insulators are now receiving more attention, as well as methods of testing. Electrolytic lightning arresters continue in favor; they should be supplied with a charging resistance, and charged daily. When combined with a ground wire, it represents the best protection available. Multigap arresters avoid the daily attention required by electrolytic arresters. Horn-gap arresters are usually used with fuses. Lines should be regularly patroled and complete records kept. Patroling should be considered when routing the line. Surges should be limited in number by doing as little switching as possible, and with the minimum number of operations. Inductive interference with telephone lines is considered and the Marysville case referred to. In this case it was sought to enjoin the operation of a 6,600-volt line, but a test showed that there was no interference and the suit was dropped. Proper attention to tying, to transposition, to spacing and to leakage should prevent interference.

In presenting the report, Mr. Wagner called attention to the fact that at the Philadelphia convention of the National Electric Light Association the approval of the report of the Committee on Overhead Line Construction had been rescinded so far as Section III was concerned, and that the paragraph dealing with "scope" had been altered so that the specifications no longer applied to crossings of telephone and telegraph wires with lighting and power wires of over 5,000 volts.

W. S. Culver stated that there had been little change in the situation respecting lightning arresters during the past year, but that new types will soon be available. He referred to the advantages of including resistances in the charging circuit of the electrolytic arrester and the necessity for the proper grounding of the ground wire. Tests have shown that it is better to have the arresters located at the transformers rather than at other points of the line. He advocated the use of arresters that will protect the apparatus even though they may be themselves destroyed.

F. C. Caldwell spoke of two important points with respect to insulators. These should not break down under lightning conditions, but should spill over without damage when the voltage becomes too high. Testing with high frequency, as supplied by a Tesla transformer, has two advantages: (1) It simulates lighting conditions, and (2) it bathes the insulator with the discharge instead of spilling at a single point. This is more likely to find a weak spot. He had been associated in the work at Marysville dealing with interference on telephone lines, and had been surprised that there was not more noise owing to the lack of proper transposition of the telephone wires. He attributed this to the transposition of the power lines. While transposition will not completely eliminate static induction, it greatly helps in reducing interference. Magnetic induction can be entirely eliminated.

J. C. Martin advocated national standards of construction for power companies and considered it a step backward to abandon any standards already established, as this encourages the Legislature to establish standards which will be even less satisfactory.

L. C. Anderson and O. H. Hutchings pointed out that the N. E. L. A. specifications had not been entirely abandoned and that there would be a new report forthcoming with a classification of voltages.

D. L. Gaskill told of the experience he had had at Greenville, where 85 miles of transmission line had been constructed. He considered it poor policy to permit any tree within possible striking distance of a transmission line and favored erecting a line on public highways wherever possible on account of increased accessibility. It pays to buy the best lightning protection one can get. He mentioned $1,000 per mile as an average cost for a 33,000-volt line, using No. 4 wire on 30-foot poles. For a 6,600-volt line the cost would be about $700. Right of way should not cost more than $1.00 per pole when on private ground. Some companies use cross-arms which are too small. Washington fir, four by five inches, was used at Greenville. The spacing of poles was 125 feet.

L. C. Anderson stated that he had paid even less for right of way.

M. H. Wagner and O. H. Hutchings both considered 125 feet too short a span, since a short span involves a greater number of insulators and consequently more insulator trouble. Spans of 200 feet using angle-iron cross-arms are preferable, and the saving in poles will pay the additional expense.

In closing the discussion, Mr. Wagner advocated following the N. E. L. A. specifications as far as possible. He objected to being bound by them where they were not feasible. Refering to the spacing of steel towers, he said this would depend upon the size of the conductor and the strength of the tower and is influenced largely by the topography of the country. For a No. 4 wire, 400 feet is about right. For larger wires the span and the spacing would also be increased.

Accounting.

The report of the Committee on Uniform Accounting was then presented by L. K. Funkhouser. Five meetings of the committee had been held, an expert accountant had been employed and interviews had been conducted with the accountant of the Public Utilities Commission, who was cooperating with the committee. The standard classification of accounts which had been adopted would be submitted in printed forms and the committee suggested dividing companies

into three groups according to the gross revenue and arranging the subdivisions of the accounts differently for each group. If this suggestion of the committee was indorsed the committee would proceed to work out such subdivisions. This was suggested with the idea of keeping the needs of the smaller companies in mind. This report was discussed by D. L. Gaskill, Weare Parsons, J. C. Martin, W. W. Freeman and C. V. Hard. It was not desired to approve the report of the committee until there was a chance to inspect its work and a motion was finally passed to receive the report and refer it to the Executive Committee for action.

At the afternoon session an address was made by Dr. Thomas Darlington, secretary of the Welfare Committee of the Iron and Steel Institute, on "Welfare Work in Industry." This dealt principally with the conditions affecting health and disease. Since efficiency depends largely upon health, the economic value of the latter is great, and money spent by the employer in providing good drinking water, ventilation, suitable conditions for eating, and cleanliness, is wisely invested.

At the session on Thursday morning the Executive Committee recommended the abolishment of the Committees on Publicity, Insurance, and Rate Research, and the establishment of an Editorial Committee, with the secretary as chairman. These recommendations were adopted by the Association.

Selling Power.

A paper by J. H. Mitchell entitled "Power Service" was then presented for discussion. This paper will be found in last week's issue.

The discussion was opened by Thomas F. Kelly, who spoke of the value of the paper. It showed how thoroughly the larger central stations prepare their plans to secure power business. The smaller companies should do likewise and seek the aid of the Committee on New Business Co-operations when necessary. Every central-station manager should ask himself whether he is keeping in touch with the power customer after the contract has been secured, as advocated by Mr. Mitchell.

D. L. Gaskill thought that the small company does not give enough attention to the power business and gave as instances two towns which had found such business well worth going after.

F. B. Steele pointed out the change of conditions which has occurred in recent years in the power business. He considered the paper very valuable on account of the plans it gave for methods of attacking this field, but one important point had been omitted; a blueprint should be supplied showing the layout with and without electric drive. There should also be a list of motors with speeds and other details. Some companies bind these reports for preservation, as they have been found to be very valuable for future use. It is well to emphasize the number of belts, shafting, etc., eliminated by the use of motor drive. The power engineer should give the customer all the advice possible and disregard any particular manufacturer's interest in this connection. He told of one case in which a customer had been saved $700 in this way. As the revenue from power equals or exceeds the revenue from lighting in most companies, it should receive greater consideration.

S. G. Hibben said that the paper outlined the modern method of campaign and soliciting customers. Power and lighting should go hand and hand. He referred to the advertising value of a lighting campaign in introducing power and gave instances. The same methods which were suggested in the paper might be applied to lighting.

L. R. McCleary asked whether the proposed tests were worth while for the average customer and where the central stations were to get the power engineers. Co-operation was desirable in order to enable the small central stations to follow the methods of the large companies.

F. D. Elwell referred to the reluctance of the small companies to go after the large power customers. It is important to tackle a prospect at the proper psychological moment.

W. R. Power considered the easiest method of getting a customer was to make a trial installation and this was cheaper than a long solicitation. Most prospects will capitulate when they see the greater output possible with electric drive. During the trial period the customer is asked to pay only for the current used. From the financial standpoint it would be safe to run during this period for the previous cost of operation, but the Utilities Commission would not permit this method of charging.

J. E. North said that a great deal of power business could be secured without the services of a power engineer, but the time comes when it is necessary in order to secure certain prospects. Very often more than a mere report is necessary. He thought it would be desirable to get the salesmen of the manufacturers at the conferences held by the Committee on New-Business Co-operations, as they can be of great help on power problems.

A discussion then ensued as to the advisability of dividing up the Committee on New Business Co-operations and this was participated in by J. E. North, Samuel Scovil, Weare Parsons, L. C. Anderson, P. H. Kemble, D. L. Gaskill and Mathias E. Turner. A motion was finally passed enlarging the committee to nine members, of whom three should be specialists.

J. C. Martin then gave his experience in securing two customers who operated a planing mill and a grain elevator, by trial installations. In both of these cases the prospect was secured in spite of an increase in cost of operation, owing to the other advantages of electric drive.

W. R. Power emphasized the importance of the service to the customer and gave an example to illustrate this.

H. W. Brooks had found it interesting to compare the methods of selling power in different central stations. Technical matters which the prospect could not understand are often injected into a report. He had found that of the 30 or more possible reasons for using central-station power, there are usually two or three that would appeal to the prospect and it was sufficient to emphasize these. The expense of a complete power report can often be obviated.

In closing the discussion Mr. Mitchell said that the same treatment was not suitable for every prospect. The report should throughout be interpreted in dollars and cents, which every prospect can understand. A report such as that outlined is usually needed only for large power users and where the competition was keen. Where cost is not the deciding factor, it is not necessary to work this out in detail.

Municipal Ownership.

H. J. Gonden then read a paper entitled "Municipal Ownership." This expression, he said, is a misnomer, since usually a large part of the value of a municipal plant is represented by bonds. Since the interest on these is guaranteed by taxes, it is easy to get capital at low rates; whereas in a private plant the returns on the invested capital depend upon efficiency and economy in management. If any utility ought to succeed under municipal ownership it should be the water-supply system, and yet these are not usually well managed. While Chicago is held up as a model in this respect, he pointed out that the water rate in that city does not represent the entire cost of supply. There is usually misrepresentation in the reports of municipal operation, because the officials are not willing to admit inefficient operation. He had started an investigation and report on 100 municipal plants operating in Ohio and when this is completed it should make a representative showing. He cited 18 plants in that state which

are losing money for the municipality, the increases in rates necessary to make them self-supporting ranging from 15 to 150 per cent. Hamilton, Oxford and Lebanon are conspicuous examples of these.

W. W. Freeman pointed out that there was even more to the question than the losses which must be recouped out of taxes. In Reading, a suburb of Cincinnati, 75 per cent more revenue is needed. The maximum rate is six cents and this is often compared with the maximum of 10 cents in Cincinnati. Service under the six-cent rate is, however, really no cheaper on account of certain features of the service. The voltage is 250 for lighting, which prevents the use of the most efficient type of lamp. The regulation is poor and at maximum load the voltage drops 23 per cent below the nominal value. This results in less illumination for the money than is obtained at a ten-cent rate with good service.

Glenn Marston said that only two municipal plants out of those which he had investigated had automatic voltage regulators. The other lines had to be controlled by hand and the result of variation in voltage results in an excess cost for lamp renewals of from 20 to 50 per cent, which he had figured to be equivalent to seven cents per kilowatt-hour in addition to the nominal rate. He pointed out the very unsatisfactory conditions in Hudson, where the plant itself had been a gift, so that there was no interest on bonds to be met, and yet there was an enormous percentage loss each year on the operating costs alone.

Samuel Scovil favored the use of the expression "users' public utility." He said that if the entire cost was to be paid by the users, there would be no municipal plants. There had been a municipal plant in Cleveland for eight years, but in that portion of the territory where there was competition with a private plant the municipal plant could not obtain business at the same rates. A new municipal plant was placed in operation a few days before the convention and a rate of three cents per kilowatt-hour had been announced, but there seemed to be no desire to take on any but large users at this rate. He referred to the arguments of cheap capital for a municipal plant and balanced this against the enormous operating loss which had been given in the paper. The cost, however, is only a minor consideration in the municipal-ownership question. It is important to preserve private initiative in all directions, yet we are drifting in this country towards government control and operation of many kinds. Bills are now pending for a trade commission to regulate private business. He considered a great danger lay in magnifying government activities and the resulting bureaucracy. If cities borrow very largely they will soon find their credit pushed to the limit and rates for interest will be as high as for a private company. There are many things which a municipality must do, such as establishing sewers, parks, etc., and the cost of money for these will also be increased.

F. C. Caldwell said that a disinterested study of municipal ownership had led to two conclusions which would be generally accepted: (1) competitive municipal ownership is a bad thing from the economic standpoint, regardless of what decision might be reached where there was a monopoly; (2) under present political conditions municipal ownership is undesirable anywhere. Even where the conditions locally are good at the present time or when the plant is established, one cannot tell when these conditions may change. Municipal plants are weak in educating the public to the use of electricity. Advertising is an important form of education and municipal plants never engage in this. Regarding the cost of capital, he thought that the rates for money depended largely upon the public relations of the operating company and they would be low if the attitude of the public insured security to the plant.

P. H. Kemble emphasized the effect upon the rates for capital by pointing to the example of Toronto. This city formerly borrowed money for four per cent; whereas recently its 4.5-per-cent bonds could not be sold for more than 82. He said that municipal ownership was not a question of principle. There are some utilities which are required by all inhabitants of a municipality and it is necessary for the city to supply these, such as schools, parks, etc. The dividing line should be made at those utilities which do not serve all. This point should be emphasized in all municipal-ownership arguments.

J. C. Martin told of the experiences of Wilmington in municipal ownership. The plant there, which had cost $40,000, was sold at the end of ten years for $12,000 and it was calculated that the city had paid about $10,000 per year for the operation of 50 street lights. He thought the solution of the municipal ownership problem lay in putting such utilities under the same control as private utilities, viz., by the state Public Utilties Commission. No publicly owned plant pays any taxes to any subdivision of the state, and this is unfair to the other subdivisions. Tax laws should be changed so as to tax municipal property.

Thomas R. Woulfe told of the experience in a municipal ownership fight in a suburb of Cleveland, where an overwhelming vote had been cast in favor of municipal ownership in spite of a very low figure which had been offered for municipal lighting. This example seemed to point out that municipal ownership was inevitable in spite of the question of cost and efficiency.

Thomas J. Ryan, of the General Electric Company, in reply to an intimation that he had encouraged the establishment of municipal plants, asserted the contrary and pointed out that such plants were started in many towns at a time when transmission had not reached its present stage of development and that was the only way for the town to secure electric service. Municipal plants cannot secure as good management as private plants on account of the insecure tenure of office.

In closing the discussion Mr. Gonden spoke of the prevalent demand for economy and efficiency. As yet, government bodies have not shown these characteristics, but pressure will bring it about.

Electric Vehicles.

The report of the Committee on Electric Vehicles was then presented by Mathias E. Turner. This report will be found elsewhere in this issue.

The discussion was opened by Thomas F. Kelly, who referred to the need for a cheaper electric vehicle than is now on the market. Industrial electric trucks have effected immense savings and their use is being greatly extended. He thought the proper way of extending the vehicle business was through co-operation with the vehicle manufacturer, yet experience shows that plants located where there is no active agent for vehicle manufacturers do not accomplish much in securing this class of business. Every central station should get in touch with an aggressive vehicle manufacturer and map out a campaign for this business. He suggested that the next Vehicle Committee formulate some sales plan involving co-operation between central station and manufacturer.

W. R. Power quoted C. P. Steinmetz as saying that a low-priced vehicle is soon coming and there is danger that it will not be properly cared for. There are few towns where there are now facilities for this. With proper care there is a great saving in the use of electric trucks, but where they are not cared for they are a poor advertisement. Central stations should see that there are proper garage facilties in their towns.

F. C. Caldwell said that he used an electric vehicle and finds it very superior to a gasoline car. More can be done with such a vehicle than is generally supposed. The convenience is

much greater where the battery can be charged at home and he thought the central stations should encourage private charging equipment. Most garages have poor attendants to care for the cars and provision should be made for competent overhauling at intervals. The central station could do good work by providing for this.

F. Nelson Carle said that the manufacturer could not put a selling organization in the small towns. Where the central-station man can place an electric vehicle he owes it to the industry to do so. Time is necessary to develop this industry and the manufacturer is ready to co-operate wherever it is possible. Sales are not always easiest near home but where the sentiment has already been worked up.

C. W. Chapelle stated that the manufacturers were ready to co-operate and gave figures indicating the great possibilities of motor vehicles and the elimination of the horse. Repeat orders for electric vehicles are very frequent. He pointed out the advantages of electric vehicles as compared to gasoline trucks. Among these are the fact that depreciation does not exceed ten per cent per annum and that they are in service most of the time. He gave figures for the costs of operation of both electric and gasoline trucks and electric passenger cars and tower wagons. The income to the central station is annually about one-tenth of the purchase price and it is an off-peak load. He then referred to the charging of the batteries and the advantages of the constant-potential system. This is economical, fool-proof, and good treatment for the battery. It is not so applicable to pleasure vehicles as to trucks.

W. R. Power referred to the garage charges for complete service. He considered it better to have separate charges for service and electric energy and the central station should encourage this.

M. E. Turner said that the manufacturer should be the best salesman, but here, as in the case of other specialties, the central-station man is asked to do the selling. This is quite different from the case with electric motors. He expressed some doubt as to the wisdom of continuing the Committee on Electric Vehicles.

In the afternoon an illustrated lecture was given by M. Luckiesh, of the Nela Research Laboratory, Cleveland, O., entitled "Light, Shade and Color in Illumination."

New Business.

At the session on Friday morning, the Finance Committee reported a satisfactory audit of the treasurer's accounts.

Thomas F. Kelly then presented the report of the Committee on New-Business Co-operations. This report told of the conferences which had been held by the Committee during the year. These were three in number and took place in Toledo, Dayton and Cleveland. These were attended by 75, 65 and 50 delegates respectively. The personal contact between the salesmen was of much benefit, as well as the information obtained through the papers presented and their discussion. The Committee recommended the continuation of its work and the holding of five conferences during the next year in Toledo, Cincinnati, Cleveland, Dayton and Columbus. At least one paper concerning the securing of power business should be presented at each conference. Three appendices were attached to the report, two of these being the reports of the conferences which had been published in the technical journals. The third was an account of the electric cottage exhibited by the Springfield Light, Heat & Power Company and prepared by J. E. North. Reports of the conferences were published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for March 7, April 25 and May 30.

In opening the discussion upon the Committee's report, Mr. Kelly expressed regret that so few central stations showed a desire to co-operate in the work of the Committee. He considered the wiring of old houses an important activity for every central station and thought that help in this direction could be obtained by participating in the work of the Committee.

J. E. North was then called upon to tell of the electric cottage at Springfield and the method of making the arrangements. He said that a larger cottage would be preferable, as the attendance was so great as to crowd the small one which was used. This was a five-room bungalow. Splendid co-operation was had from the real-estate agents and purveyors of material. The largest attendance in one day was 350 and the total attendance in 18 days about 1,800. The cottage was open from 1 to 9 p. m. The experiment was considered a great success.

W. A. Wolls said that the members of the committee felt disheartened when only 17 replies were received from the 100 central stations to whom the question was put as to how it could be of the greatest help. He referred to the advantages of meetings and conferences which had been arranged. He said that co-operation must begin at home between the different departments of the central station. Unless this is secured the results are going to be poor. He pointed out how a visiting solicitor could be of assistance in small towns where there was only a superintendent to look after new business. He considered it desirable to serve every possible customer within the territory covered by the franchise, even though an extension of line might be necessary to reach it.

D. L. Gaskill testified to the good results of co-operation between a large and a small company in loaning men. As a result of one instance of this, he had secured a 400-horsepower contract at an expense of about $25.

Parker H. Kemble said there was a great lack of grasp of business principles among men running new-business departments. He was tired of hearing "co-operation," which should be superseded by "co-ordination"—making things work together. The heads of new-business departments should train the men to carry out their plans and in approaching any new problem should consider what has been done, what is being done, what ought to be done and what can be done. An important consideration was the selection of the business to be gotten, and this should always depend upon the cost of getting it. He compared new-business campaigns to military tactics, and said it was necessary to go after the important and strategic points. A great deal of money can be wasted in so-called missionary work, but it can also be made productive of good results. The men in the department must understand what it is wished to be accomplished. Ohio territory secures natural gas at prices from 5 to 60 cents per thousand cubic feet. This gas will give about 1,000 heat units per cubic foot. Under such circumstances electric cooking cannot hope to compete in cost and he thought better results could be secured in applying the effort in other directions.

Glenn Marston pointed out that to make money a company must first make friends, and the domestic load is desirable also because outside of lighting it is largely a summer load. He thought the use of current was a convenience rather than a question of competition in cost with gas.

W. R. Power pointed out that collectors often make trouble for the new-business department on account of their attitude, which was not one to make friends for the company.

In closing the discussion, Mr. Kelly stated that the attendance at the meetings of the Committee conferences was sufficient evidence of the value of the work done. He referred also to the importance of meetings of the heads of departments. The Dayton company had found this to be very valuable.

The Nominating Committee then made its report. This Committee consisted of O. H. Hutchings and G. E.

Miller, elected by the members of the Association at the meeting on Wednesday; L. C. Anderson and W. A. Wolls, appointed by the Executive Committee; and William J. Marshall, appointed by the president. The Committee offered the following nominations and the meeting elected them unanimously:

President, C. V. Hard, Wooster.

Vice-president, W. J. Rose, Alliance.

Secretary-treasurer, D. L. Gaskill, Greenville.

Executive Committee: F. J. Derge, Toledo; L. C. Anderson, Middletown.

Advisory Committee: F. M. Tait, Dayton; W. W. Freeman, R. P. Stevens.

Finance Committee: J. H. Kermode, Cleveland; F. O. Plymale, Elam Fisher.

Meter Committee: A. H. Bryant, Cleveland; George E. Snider, Ray Wolford, John K. Himes, F. L. Allen.

Editorial Committee: D. L. Gaskill, Greenville; W. Parsons, T. F. Kelly, W. A. Wolls.

Illumination Committee: S. E. Doane, Cleveland; P. H. Kemble, Emerson Franklin.

Electrical Transmission Committee: M. H. Wagner, Dayton; S. M. Rust, E. E. Noble, W. R. Power.

New Business Co-operations Committee: T. F. Kelly, Dayton; J. E. North, J. H. Mitchell, L. R. McCleary, R. A. McGregor, F. C. Morrison, H. B. Bixler, H. C. Gillie, E. Quillen.

Electric Vehicle Committee: C. W. Chappelle, Cleveland; R. H. Wright, J. C. Matthieu.

An address on "Indeterminate Franchises" was then delivered by Halford Erickson, of the Wisconsin Railroad Commission. This address will be found elsewhere in this issue.

E. W. Doty, of the Public Utilities Commission of Ohio, was then called upon and expressed the opinion that it is not fair nor wise for utility companies to pay special taxes which must be collected from its customers in the form of rates.

James V. Oxtoby, of Detroit, was also called upon and pointed out that amortization was obviated by the indeterminate permit. This is desirable, since amortization is usually ignored by companies having short-term franchises. At their expiration a satisfactory arrangement for extension is usually made, but sometimes this cannot be worked out and then the company finds itself in a bad position. The Supreme Court of Michigan recently made a ruling on a provision of the state constitution restricting franchises to 30 years. The city of Detroit had issued an indeterminate franchise to a street railway with a provision for purchase when desired by the city. The court ruled that all franchises were limited automatically to the term of 30 years, which makes the indeterminate permit impossible in that state.

The report of the Appraisal Committee was then made by A. P. Martin, as none of the members of the Committee were present. The work of the Committee was outlined. Forms had been prepared and printed and samples sent to the principal companies. The Committee was now considering the determination of reproduction cost new and depreciation and would soon send out a statement concerning these. He stated that representatives of the manufacturers were ready to assist the companies in determining reproduction cost and gave the names of the following representatives for that purpose: E. G. Waters, General Electric Company, Schenectady, N. Y.; E. P. Dillon, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Mr. Webster, the engineer of the Committee, in answer to a question, said that underground construction had not been separately considered, as very few of the companies have property of this kind. Those who had will find the forms of the Cleveland central station satisfactory for the purpose. The Committee favored the determination and use of observed depreciation. The age of apparatus was not included in the forms for this reason, as depreciation is not determined merely by age. It is intended to send an engineer to the small companies to help get the work of appraisal started when occasion arises. Mr. Doty stated that the Public Utilities Commission would also be ready to send a man out to help the companies get their work started.

A rising vote of thanks was then passed to Messrs. Darlington, Luckiesh and Erickson for the addresses they had made before the Association. The president-elect, Col. C. V. Hard, was then introduced and made a brief speech. The convention then adjourned.

Entertainment.

The entertainment features of the convention received the usual careful attention. An informal ball was held on Tuesday evening, a banquet and entertainment on Wednesday evening, and the Association ball on Thursday evening. On Thursday afternoon there were swimming and racing contests in the water, with suitable prizes for the winners.

For the ladies, several card parties were held and also a bowling party, at which handsome prizes were awarded to the winners. There was also a launch ride on Wednesday afternoon, and several musicales, the soloist being Miss Ruth Skeel.

A. A. Serva was chairman of the Entertainment Committee and the entertainment of the ladies was carried out under the direction of Mrs. W. H. Pearl. E. A. Bechstein was chairman of the Committee on General Arrangements.

Jovian Rejuvenation.

On Thursday evening there was a rejuvenation of the Jovian Order under the leadership of Thomas F. Kelly, statesman for Ohio. The Degree Team consisted of Jupiter, L. N. Pyle, Detroit; Neptune, L. K. Funkhouser, Dayton; Pluto, J. W. Schrantz, Cincinnati; Vulcan, F. C. Caldwell, Columbus; Hercules, Thomas J. Wheatley, Cleveland; Mars, W. E. Bischoff, Chicago; Apollo, F. W. Godfrey, Columbus; Imps, F. B. Steele, Dayton; Glenn Marston, Chicago; S. F. Messer, Kent.

The following six candidates were initiated: A. L. Thuma, F. F. B. Carr, J. F. Hanley, W. W. Steele, H. J. Gonden and E. A. Bechstein.

On account of the excessive heat the short ritual was used and floor work was dispensed with. A splendid rendering was given by the excellent picked degree team. Following the rejuvenation a Dutch lunch was served.

W. E. Bischoff attended the rejuvenation as a special representative of Jupiter W. N. Matthews. He told of the arrangements being made for the next annual convention, which is to be held at St. Louis in October, for which a large attendance has been promised.

Low River Stage Throws Heavy Load on Steam Plant.

The low stage due to drouth of the Ocoee River has so affected operations at the Tennessee Power Company's hydroelectric plant that it is able to furnish only a small amount of the power it was designed to supply and it has been necessary to draw on the plant of the Nashville Railway & Light Company to supply the needs of Knoxville, Chattanooga and intermediate points. The plant of the Chattanooga Railway & Light Company is out of date and its satsfactory operation is out of the question. This leaves the Nashville plant, the most up to date of all those owned in the central part of Tennessee by the Clark interests, to carry practically all the load.

These facts came out the other day when the smoke-abatement officials of the City Commission had the company on the "carpet" because of the smoke it was making. It was explained that with the load the plant had to carry it was impossible to keep the smoke down.

The coal miners of Kansas produced 7,202,210 short tons in 1913, valued at $12,036,292.

BOOK REVIEWS.

"Telephone Construction, Installation, Wiring, Operation and Maintenance." Second edition, revised and enlarged. By W. H. Radcliffe and H. C. Cushing, Jr. New York: The Norman W. Henley Publishing Company. Cloth, 213 pages (4¼x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00.

This is an elementary treatise describing and illustrating up-to-date methods of telephone practice without assuming any prior knowledge of the subject on the part of the reader. The book takes up approved methods of installation and wiring, protection from lighting, and also inspection, repair and maintenance. Line wiring and the wiring and operation of special telephone systems, including automatic exchanges, are given. The illustrations are numerous and the volume should be useful to architects, contractors, wiremen and others wishing to obtain a general idea of telephone practice.

"The Year-Book of Wireless Telegraphy & Telephony." New York: Marconi Publishing Corporation. Cloth, 800 pages (6 x 8½ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $1.00.

The object of the "Year-Book of Wireless Telegraphy & Telephony" is to place at the disposal of those interested in the subject all the information available concerning wireless in such a way that it may be obtained without difficulty and without the expenditure of useless effort. Since the Year-Book for 1913, 200 pages of information have been added. The contents are exhaustive, instructive and certainly of great practical value and usefulness. The chapter devoted to the record of the development of wireless telegraph epitomizes the history of the art from the time in 1831 when Faraday discovered the electromagnetic induction between entirely separate circuits, down to 1913, covering the use of portable wireless sets in the last Balkan war. A chapter of 34 pages is devoted to a full development of the articles of the International Radio-Telegraphic Convention adopted in London, July 5, 1912. There is also a chapter devoted to the proceedings of the International Conference for Safety of Life at Sea held in London last winter. The wireless regulations and laws of all countries are alphabetically arranged. The text concerning this feature occupies 127 pages.

A very useful list is that of the wireless telegraph stations of the world to be used in connection with the map issued with the volume. A list of ship stations in the various countries giving their call signals, range in nautical miles, the steamship lines to which they belong, wave length, nature of service performed, hours of service and the charges for sending messages is given.

The volume also includes articles on various phases of wireless work by the leading authorities of today, and there is a considerable amount of useful formula and equations, together with a glossary of terms included.

"Modern City Planning and Maintenance." By Frank Koester. New York: McBride, Nast & Company, Cloth, 330 pages, (7x10 inches), numerous illustrations. Supplied by Electrical Review Publishing Company, Inc., for $6.00.

While city planning dates back to antiquity and the engineers and builders and architects of old evolved principles and ideas upon which but little improvement is yet evident, there has come about a growing need for specific information with regard to city planning that involves a recognition of our modern systems of transportation and our modern methods of illumination, and the supplying of energy and heating of our buildings. The development also of great industrial undertakings involving industrial communities of large size, makes necessary also the consideration of conditions which are essentially new. The author has brought down to date the modern conception of city planning and maintenance. A student of civic conditions, of economics and an engineer of known repute, he is exceptionally well equipped to balance what is artistic and beautiful of the old into a harmonious and practical application with what is new and necessary. The present volume will be of value to everyone interested in the development of the modern utilities of living, whether it be for a small community or for a city of immense environments. A review of the book would not be complete without some special mention of the fine typography, the excellent quality of paper, the master workmanship of the book as a piece of binding, and the fine printing qualities of the paper and engravings which embellish the work.

"High and Low-Tension Switchgear Design." By A. C. Collis, New York: D. Van Nostrand Company. Cloth, 218 pages (5½x8¼), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $3.50.

In the issue of May 9 a small book "Switchgear and the Control of Electric Light and Power Circuits," by the same author, was reviewed in these columns. The present volume covers somewhat the same ground as does the small one, but its treatment is more in detail and exhaustive. It deals almost exclusively with English and Continental practice, but since the principles of and, in general, the problems affecting the design, installation and operation of switching equipment are just about the same on both sides of the water this feature does not materially interfere with its usefulness to the American reader.

It seems to the reviewer that the title is a misnomer. The volume can hardly be considered a treatise on design. The title "Notes on Switchboard Design" would, possibly, be more expressive of its actual scope. In fact, the author states in Chap. I: "It is not the intention to deal exhaustively with the subject but to place on record diagrams and results obtained within the scope of his experience in design." The book is then, apparently, a collection of notes and data from its author's experience. It covers some of the subjects very completely and splendidly. Others it does not consider. It does not consider, in a systematic way, all of the essential elements that must be thought of in laying out a switching equipment.

There are two parts. Part I, comprising chapters I to IV inclusive, deals with alternating and Part II, chapters V to VIII, with direct-current switchgear.

Chapter I (25 pages) is general and introductory in its scope. Chapter II (50 pages) deals largely with oil switches. Oscillograph records giving the behavior of direct and alternating-current oil switches at the time of opening, under different conditions of current, load, voltage, line characteristics and the like are given. Those records are very interesting and should be valuable to switchgear designers. The essential data from experiments to determine oil pressure within switch tanks is also given.

Chapter III (26 pages) treats of Relays, Switchboard Transformers, Synchronizing, etc., and chapter IV (25 pages) is devoted to Watthour Meters and the other essential instruments.

Chapter V (22 pages) deals with Direct-Current Circuits and chapter VI (10 pages) with Air-Break Switches and Direct - Current Switchboard Equipment for different purposes.

Chapter VII (13 pages) concerns Switches for Mine Installations, Connections for Balancers and Boosters.

Chapter VIII (18 pages) deals with Synchronous Motors and Power-Factor Correction, Two-Phase to Three-Phase transformation.

An appendix gives the English Board of Trade Regulations.

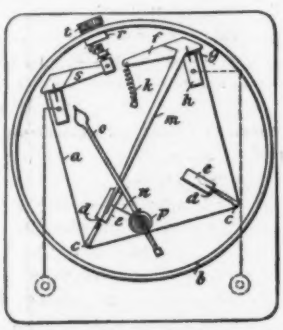
Considered as a whole, the book contains much valuable information of a practical nature which has, evidently, been gleaned from its author's experience. The treatment is mathematical in some cases, but these are not many and they will not interfere materially with the usefulness of the book to the practical man.

New Electrical and Mechanical Appliances

A New Hot-Wire Instrument.

A patent recently issued in England to E. I. Everett and K. Edgcumbe, of London, covers a unique form of hot-wire instrument for measuring alternating currents or voltages. It has a considerable length of wire in a case of ordinary instrument size. For the description and diagram, we are indebted to *Engineering*, of London.

Elastic supports are used at the points of flexure of the wire, which supports are flexible only in the plane of the wire and allow the expansion of the wire, due to the heating effect of the current, to take place without appreciable friction. The hot wire is bent round a curved surface attached to the free end of a flat spring, the other end of which is attached to a fixed support situated within the curve of the hot wire. The wire *a* is arranged within a circular casing *b* so



Compact Hot-Wire Instrument.

that it occupies three sides of a square, and at the two points of flexure the wire passes round a grooved guide *c* (shown in side elevation at the right) attached by means of a flat spring *d* to a fixed support *e*. The plane of the spring *d* it at right angles to the axis of the wire.

One end of the wire is attached to the short arm of a magnifying lever *f*, which is secured by means of a flat spring *g* to a fixed support *h*. The spring *g* is similar to the springs *d*, on which the guides *c* are supported, and acts as a pivot for the lever. The longer arm of the lever *f* is secured to a controlling-spring *k*. The lever *f* carries a light index-actuating arm *m* extending diagonally across the square, and connected at its outer end by means of a silk thread *n* or other suitable means to an indicating pointer *o*, round the pivotal axis of which the silk thread is wound. The pointer is provided with a helical spring *p* or other suitable device for taking up the slack in the silk thread.

The other end of the wire is attached to a lever *s* similar to the lever *f*, but it is provided at the outer end of the longer arm with a suitable zero-adjusting device *r*, which may be of any convenient construction. In the drawing it is shown as consisting of a milled head *t* havig a shank projecting through the casing, and carrying a projection engaging with a projection on an adjusting screw bearing on the outer end of the lever *s*, so that when the head *t* is rotated the screw causes the lever to move in one direction or the other, this movement being transmitted through the wire to the pointer, which can be thus set at zero.

Benjamin Mogul-Base Sockets for Gas-Filled Mazda Lamps.

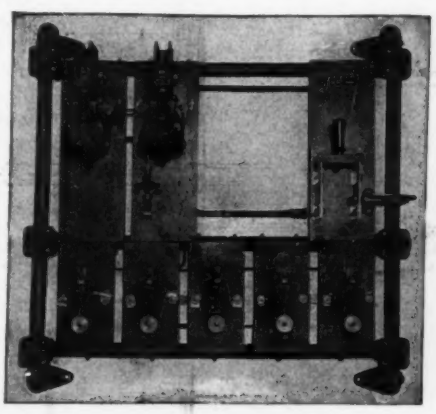
As a part of the new line of fixtures for the gas-filled Mazda lamps the Benjamin Electric Manufacturing Company, Chicago, Ill., has placed upon the market two new Mogul-base sockets. They are two-piece porcelain sockets with means for attaching to a flange or surface. The base portion carries the binding terminals. The latter are easily accessible for wiring. In the socket shown in Fig. 1 wires are brought in through side outlets in the upper portion; in Fig. 2 through the central opening. The lower portion is provided with socket shell and bronze spring center contact. It can be used interchangeably with either base, and is attached by two screws which form electrical connections as well as furnish means of support.

Benjamin Sockets. Fig. 1—With Side Outlets. Fig. 2—With Center Opening.

Among the characteristic features of the Benjamin line of fixtures are their patent lamp grip, which prevents loosening and falling of the lamp, the provision for ventilation, for protection against rain or snow, and the fact that the weight of the fixture proper is supported by the stem rather than the socket. A new two-color bulletin has just been issued covering this complete line of devices. It can be secured by addressing any of the company's offices.

A Crane Protective Panel.

A new protective panel for cranes has recently been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This panel is for use in connection with manually operated, nonmagnetic controllers and serves a two-fold purpose: (1), it provides complete protection to the crane motors and electrical equipment from overloads, grounds and short-circuits; (2) it prevents injury to workmen while making repairs by locking the line switch in open position.



Crane Protective Panel.

The line current is controlled by a double-pole line switch, which is so arranged that it can be locked open by padlocks inserted by men at work on the crane and cannot be closed until all the padlocks are removed.

Each side of the line is opened and closed by a magnet switch controlled by a series relay in each motor circuit and one in the common side of the main circuit. If the current at any

point rises above the setting of the relay, the magnet switches are opened and the current cut off. Both sides of the line being protected by the relays, failure of these to operate because of grounds is made impossible.

The relays are reset automatically after operating, but the magnet switches will remain open until a push-button in the crane cab is pressed.

Splicing Link for Socket Pull Chain.

The growing use of pull-chain sockets and receptacles has called for a convenient and reliable means of splicing an extension to the chains furnished with the sockets when the latter are mounted too high to be reached. For this purpose there has been placed on the market a handy little splicing link, a view of which in use is shown herewith. From the side this link looks like the letter S. The ends of the reverse bends are solid, but the main portion is slotted with a round hole in the middle. The last bead of the chain is inserted in this hole, then the chain is pushed along the slot until the bead is caught by the reverse bend which is squeezed over the bead, securing it in place. It takes but a few seconds to make a splice and no tools are required. The links are made in brass, bronze and nickel finishes by O. H. Allen, 256 Belmont avenue, Brockton, Mass.

Splicing Link in Use.

Reverse-Power Relays for Protection of Parallel Feeders.

The need for a reliable reverse-power relay has been appreciated for a long time, particularly in substations fed by parallel feeders. In case of a short-circuit or ground on one feeder, a selective reverse-power relay that will not operate on overload is the only means for completely isolating the feeder, the reversal of power at the substation end causing that relay on the defective line only, to operate.

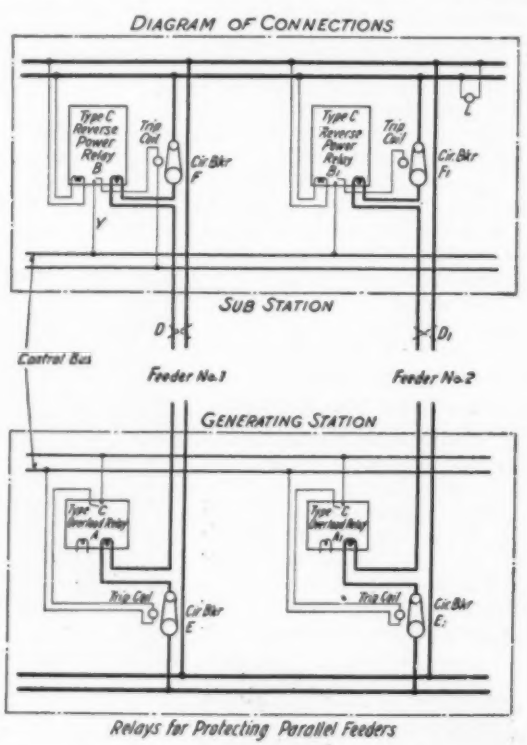
The diagram herewith makes clear why this is so. It shows two parallel feeders from the generating station to the substation. For simplification, the layout is single-phase, but three-phase operation is similar when three relays are so connected that voltage and current are in phase in each relay. At the generating station are plain overload relays, set for a comparatively long time element. At the substation are two sets of Westinghouse selective reverse-power relays, one set for each feeder. When the direction of power is normal (both feeders supplying power to the substation), the reverse-power relays cannot trip their breakers no matter how heavy the load may be.

If a ground or short-circuit occurs at *D* on feeder No. 1, there will be caused a heavy current on both feeders, for feeder No. 2 will supply power through the substation and back on feeder No. 1 to the point of short-circuit. Thus the direction of power is reversed at relay *B* in the substation. This reversal of direction of power is the only thing that can cause relay *B* to operate. As soon as circuit-breaker *E* is opened, the load on No. 2 feeder falls back to normal, and it continues to operate the substation.

This condition is effected in approximately two-fifths of a second after the short-circuit occurs. If the short-circuit continues, the overload relay *A* in the generating station will trip its breaker and the line is clear. Similarly if a short occurs at D_1, reverse power at B_1 will trip breaker F_1 and the overload at A_1 will trip its breaker.

In case of a heavy short near the substation, the voltage may drop very low, but these relays are so sensitive that they will operate correctly even if the voltage drops to two per cent.

The Westinghouse Electric & Manufacturing Company furnishes reverse-power relays especially for the purpose referred to.



Relays for Protecting Parallel Feeders

Reverse-Power Relay Connections.

Storage-Battery Overload Detector.

It has been well known that the rate of discharge of a storage battery determines the voltage limit to which it is safe to carry the discharge. In the case of a lead battery a high discharge rate, like the one-hour discharge, may be terminated at 1.7 or 1.65 volts per cell, but a low rate, like the eight-hour discharge, must be terminated at 1.8 volts. Failure to observe the proper voltage limits on discharges at variable rates has frequently been the cause of excessive discharges, with consequent serious damage to the battery from sulphation, buckling of plates or internal short-circuits, all of which produce a rapid depreciation of the battery and greatly reduce its efficiency and life.

When a battery is always discharged at the same rate, an ampere-hour meter and watt-hour meter will give an idea of the amount of discharge the battery has been subject to and can even be used to limit the discharge to a safe value for that rate. When the rate is quite variable, however, as is always true in vehicle service, the ampere-hour meter may not give a proper indication of the limit to which the discharge may safely be carried. To secure a reliable indication of this point for all cases there has been developed by the Electrical Power Storage Company, Limited, of London, England, a combination instrument known as the E. P. S. overload detector; this was recently described in *The Electrician*, of London.

A view of one form of this instrument is shown in Fig. 1. It will be observed that the instrument has two scales, the upper one showing the volts

per cell and the lower one the current. This lower scale in the particular instrument shown has its zero in the middle so as to indicate charge on one side and discharge on the other. The details of the instrument can be varied, but in general it shows three values: the total battery voltage or the actual voltage per cell, the permissible final voltage per cell and the actual value of the current. Since the latter two values are closely related, a separate scale is not always provided for the limiting voltage per cell.

An idea of the internal construction of the instrument is obtained from Fig.

Fig. 1.—Storage Battery Overload Detector.

2. It will be observed that there are two separate movements, each consisting of a D'Arsonval moving-coil galvanometer. The coil *A* is the ammeter portion of the instrument and is shown connected to a shunt in the battery discharge circuit. The coil *B* is connected across the entire battery or a portion thereof, and is the voltmeter part of the instrument. Connected

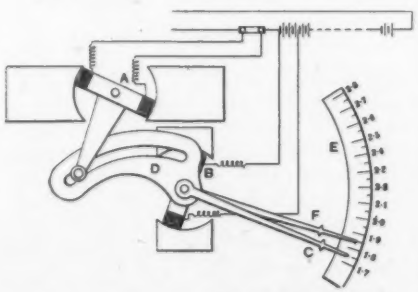


Fig. 2.—Internal Construction of Overload Detector.

with this coil is the pointer *F*. An ingenious interconnection between the ammeter moving coil and the pointer *C* is obtained through a cam-shaped segment in the plate *D*. It will be observed that movement of the coil *A* will through this plate move the pointer *C*. The position of the latter therefore will be influenced by the current actually being discharged by the battery. As the battery discharge proceeds and the voltage per cell gradually diminishes a point will be reached when the two pointers *F* and *C* will come close together. This should serve as an indication to the operator that the battery is nearly exhausted. When the two pointers actually come together an electric circuit is completed and a warning bell sounded or a graphic record made. This indicates that the limiting point of the discharge has been reached.

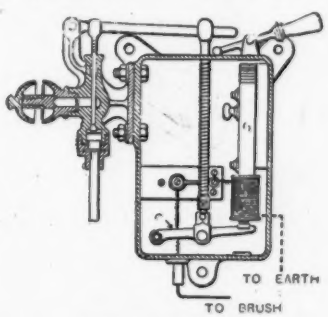
The instrument shown in Fig. 1 was designed for a battery whose one-hour discharge rate was 800 amperes and the final permissible voltage corresponding to this rate was 1.7 volts per cell. These values, of course, differ with the size and type of battery, so that the instrument is graduated accordingly. In some cases it is possible to make the final voltage limit of the cell proportional to the current so that the link between the current coil and the limit indicator may be omitted. This is the case in the instrument whose dial is shown in Fig. 1.

This type of instrument has been used by the Electric Power Storage Company to simplify the system of keeping records of its batteries under maintenance contracts. It has been found that the work of recording the performances of the batteries has thereby been reduced to a minimum. The use of the instrument also serves to reduce the cost of the switchboard, since it combines a number of instruments in one. By use of such an instrument it has been found that the care of the battery can be left in the hands of a relatively unskilled person, who need know only that the discharge must be discontinued when the warning signal is given.

Signaling on Moving Trains.

On the occasion of the Summer meeting of the English Institution of Mechanical Engineers held in Paris from July 7 to 10, six French railway engineers gave a joint account of the devices employed on their respective systems for signaling on railway trains. These systems are the Northern, Eastern, Southern, State, Orleans, and the Paris, Lyons & Mediterranean railways. All of these, excepting the Orleans, employ a device consisting of a ramp placed on the line, an electro-automatic bell, whistle or horn placed on the engine, and a signal-recording apparatus also fixed on the engine.

The fittings comprise a brush collector fixed to the engine, a switch connected to the signal box, extra warning bells at stations and signal boxes, batteries and other accessories. Batteries were formerly used on the track, but these are now being tried experimentally on the engine. The ramp is placed in the center of the track parallel to the rails and it consists of an oak beam carrying an insulated brass cover plate connected to one of the poles of the battery, the other pole connecting to earth. As the engine passes over a ramp the brush on the engine rubs the cover plate, closing the circuit back to earth through the wheels and the rails. On this circuit warning and recording apparatus is provided. The moment the circuit is closed the warning apparatus automatically actuates a horn, whistle, bell or gong, and the recording apparatus registers the position of the signal on the speed-indicator tape. There is a fixed ramp operated electrically, and a pivoted one operated mechanically. The former is used in either plate or grid-iron types, the special purpose of the latter being to cope with hoar-frost in winter. Another beam (a "shield") faces the ramp, serving to protect the nose of the ramp from being caught and torn by some projecting piece from the train. For speeds of above 50 miles an hour two ramps are employed, placed end to end so as to



Electric Whistle.

increase the duration of control, and where there is important traffic both ways two shields—one at each end of the ramp—are used.

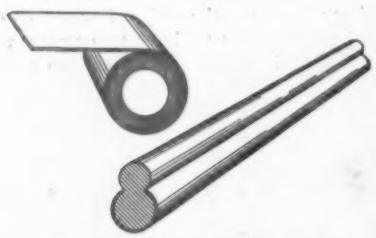
A bell-whistle warning apparatus is used on the Northern Railway and a horn on the others. The horn is blown by steam but unclutching is done by electromagnet. As the leverage of the latter is too weak to give passage to much steam, an auxiliary apparatus (a Servo-Motor) is used which opens a larger outlet direct from the boiler into the horn. Reclutching is effected either by hand or by machinery. The recording device records all signals passed by the train. As in the case of the warning apparatus, it consists of electromagnets, the armatures of which when freed actuate a series of levers, cams and eccentrics which finally gear with the speed indicator and work a special stylo pen. The brush consists of a series of small brooms of elastic copper or gunmetal wire or of steel blades—a detail decided by whether a plate or a grid-iron ramp. On the

State railways a mechanical device with electrical recording apparatus is being experimented with.

All of the systems described by the French engineers are in their experimental stage and improvements will doubtless be effected. With high-speed express trains there are missfires owing to the short time of contact, and experiment is being made with various auxiliary devices to immediately pick up the slightest motion of the armature of the electromagnet and transform it into reliable work. On the Paris, Lyons & Mediterranean system an electropneumatic device is being used.

A Removable Conducting Covering for Electrical Wires.

A flexible electric conductor has been invented and a patent secured by Louis Steinberger, president of the Electrose Manufacturing Company, Brooklyn, N. Y. The invention is intended to combine the high conductvity of a cop-



Ribbon Applied to Trolley Wire.

per jacket with the strength of a steel or other core around which it is wrapped. The conductor comprises a longitudinal supporting member, and a removable ribbon of metal with a low electrical resistance and provided with a suitable contact surface.

The conducting ribbon may be applied to the supporting wire during the process of manufacture, or it may be placed upon it after the wire is suspended. The ribbon may also be cut into any convenient length, and a worn portion may be replaced. The ribbon covering of the contact surface may be applied to compensate for the difference in the coefficients of expansion and contraction between the body portion of the conductor and the ribbon.

The accompanying illustrations show the ribbon applied to a figure-eight trolley wire, and also a coil of the copper ribbon as used for splicing and patching.

New Panel Switch Units for Panelboard Assembly.

Almost ten years ago the Bryant-Perkins companies introduced the unit panel construction, by means of which, with a single type of switch and fuse block, a panelboard for any number of circuits could be made up in a few moments.

In the latest design of Perkins panel units there are four parts, as shown in the illustration; the base which carries all the conductors and connections to the circuits, the two switch mechanisms which drop into apertures in the base, and the cover which extends across the whole front and is held by the switch knobs and fuse plugs.

All connections and conductors are concealed and separated from the front of the panel by a continuous sheet of insulating material, so that this is truly a dead-front panel, that is, there are no live parts accessible from the front.

In case a switch mechanism requires adjustment or repair, the cover of the particular unit affected can be quickly removed, and the switch mechanism lifted from its socket. It can then be inspected and repaired without danger of short-circuit and with maximum ease. If it is not convenient to repair the switch it can be replaced by a new one.

Assembled Panelboard.

A Panelboard Unit.

From the user's point of view this new panel unit has many advantages over other types. First, it is absolutely safe, which is a point well worth considering, since workmen's compensation acts have come unto vogue. Furthermore, it is very simple. "On" and "Off" are written in plain English, besides which the former is in black letters on a white background, and the latter in white letters on a black background, so that the conditions of each switch may be distinguished at a distance. The fuses are self-indicating and can be replaced by anyone without the slightest danger of contact with the circuit, and without the use of screwdrivers or other tools and the attendant danger of using them.

From the contractor's point of view the system is advantageous not only from the service side, but also from the economical side. With a quantity of these units in stock, the contractor can readily make lighting panels of any size, thus avoiding the delays in ordering special panelboards or the keeping of expensive stock.

These new panel units are manufactured jointly by the Bryant Electric Company and the Perkins Electric Switch Manufacturing Company, Bridgeport, Conn.

The Filtration of Air for Turbo-Generators.

Stress has been very properly laid in the last year or two on the importance of seeing that the air which is supplied to turbogenerators for cooling purposes should be furnished in a perfectly clean state and numerous filters have been developed for this special purpose. Among the interesting types that have found application in connection with installations in Great Britain may be mentioned those constructed on the Bollinger system by the firm of Dryers, Limited, of Manchester, England. The cleansing of the air from dust in this way is by no means a useless function, as engineers who have had anything to do with electric power plants know that, if this is not attended to, the dust carried in by the air settles in the windings of the generator and uniting with moisture and oil which penetrates with the air or creeps in from the bearings often results in short-circuits with consequent serious losses and delays.

In the system mentioned, the separation of the dust from the air use

for cooling the generators is attained by means of special filter screens contained in filter chambers which made in units and arranged in sets of ample area and capacity for the quantity of air required. Through the filters all the air used for cooling must pass. Fig. 1 shows one of the filter units with the door open, this door being provided for removing the frames carrying the filtering medium. For use with turbogenerators the filter is made in four standard sizes, either of which may be chosen and multiplied by placing them side by side to give any required capacity either in rows or tiers. The chambers are made of angle and sheet iron or steel and arranged so that the frames carrying the filter screens may be readily removed from the chamber and replaced with another set without any difficulty or delay. In this way it is possible to

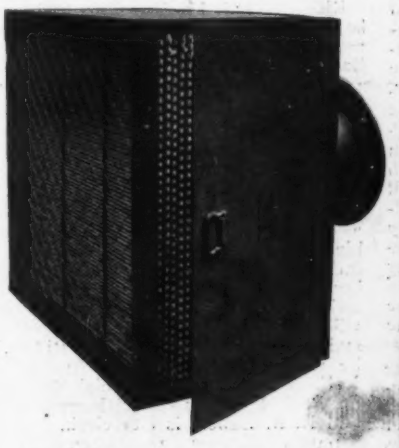


Fig. 1—One of the Air-Filter Units.

clean the filter without interfering with its operation, this being achieved by exchanging a spare set of frames with the filtering medium already threaded on them, for those contained in any of the individual filter casings. They can be so treated in rotation and the whole filter cleaned without stopping, while only one spare set of frames is thus necessary. The door can be arranged on any side and the filter can be placed in any position, sometimes being suspended under the floor carrying the generator.

The filter screens consist of wool strings stretched closely together and arranged so that the strings in each succeeding layer cover the space between the strings in the preceding one. The frames carrying the fiber screens are double and arranged to slide easily into and out of the filter chamber. Provision is made at the front and back of each chamber for a free passage of air through the filter screen. Two wire screens, one of which is placed on the entrance side and the other on the rear side of the chamber, prevent the possibility of anything passing the filter and being carried into the generator. The strings of the filter screen are of pure wool yarn twisted so that the fibers project on all sides. These strings are placed so close to each other that the fibers intermingle, forming a loose but very efficient filter mesh and although the strings are placed close together, the whole filter has sufficient area to allow the air to pass freely through it at a moderate speed and with practically no resistance. The particles of dust carried by the air strike against the strings and cling to the fibers, the air being perfectly cleaned by the arrangement so that only pure dry air passes into the generator. Fig. 2 shows a typical combined filter chamber for a large installation. Where space is very limited the frames can be mounted without the chambers directly into the brick setting of the air duct. The dirty screens can be cleaned with a vacuum cleaner or with a compressed-air apparatus and used at once to replace another dirty screen in another chamber so that only one set of spare screens is actually required.

The filters as rated work with a pressure of 4 to 5 millimeters of water when clean, which rises to 8 millimeters when dirty, but where more pressure may be allowed the rating may be increased, and it is claimed that the air used still be properly filtered. As an illustration, a filter measuring 40 by 80 by 12 inches has a capacity of 4,120 cubic feet per minute at 4 to 5 millimeters, but will also filter 4,700 cubic feet with slightly increased pressure. These filters are also used in ventilating systems and are also standardized for use with compressors. They are in use by some of the largest and best known engineering firms and it is stated that the capacity of those installed exceeds 100,000,000 cubic feet per hour. It may be pointed out that there is no danger of moisture being carried into the generator, which is of course an important consideration as contrasted with wet filters; there is an extremely low resistance to the air, and hence less power is required to force the cooling air through the screens; the selection of iron or steel for the framework gives an element of durability as contrasted with wood and little space is required. They therefore appear to present a very satisfactory solution of this modern problem.

Fig. 2—Air-Filter Chamber in Large Installation.

Suction Cleaners for Canton.

The electric vacuum cleaning system of the Palm Suction Sweeping Company, of Detroit, Mich., will be installed in 19 of the 21 public schools of Canton, O., by the Kuehn-Wilson Electric Company, of Canton, under a contract which will be let shortly by the school board, that company's bid for the work having been the lowest received.

The Hongkong Government will erect a powerful wireless station at Cape D'Aguilar, near Hongkong, China, to cost about $50,000.

Current Electrical News

NORTH ATLANTIC STATES.

SYRACUSE, N. Y.—Plans have been approved by committees of the Board of Supervisors for the erection of a power house on the site of the Tuberculosis hospital, to cost $35,000.

BUTLER, N. J.—The Common Council has appointed Frederick O. Runyon, electrical engineer, Newark, as consulting engineer in the establishment of its municipal electric lighting plant, approval for which was recently voted by the citizens. The cost is estimated at $30,000. A.

JERSEY CITY, N. J.—The Board of City Commissioners has granted the application of the Public Service Electric Company for permission to install lateral conduits on Newark Avenue, to be used for feed lines for the proposed "White Way" along Upper Newark Avenue. A.

PATERSON, N. J.—The Society of Useful Manufacturers has completed plans for its new steam-turbine power plant to be constructed at the Paterson Falls basin, at an estimated cost of $75,000. A.

CAIRNBROOK, PA.—That Central City and this city will have electric lighting for its thoroughfares soon is almost assured by the active interest among the business men concerning this project. When the plans have been definitely formed the Penn Public Service Company will probably supply the current as this company operates in this neighborhood. N.

PHILADELPHIA, PA.—In connection with the new Frankford High School to be erected by the Board of Education on Oxford Street, an electric-lighting plant, refrigerating plant, vacuum-cleaning system, and ventilating system will be installed. A.

SOUTH ATLANTIC STATES.

RISING SUN, MD.—The Council is planning ways and means to install a light and water system. Address the town clerk for particulars.

RICHMOND, VA.—A company is being organized with a capital stock of $200,000, to rebuild the Richmond electric works, recently destroyed by fire. Address J. B. Price for desired information.

BECKLEY, W. VA.—The city is considering granting a franchise to a newly-organized electric company, in view of the dissatisfaction existing on account of the rates charged by the company now furnishing current. It is said that the new company will secure current for distribution in the city from the Virginia Power Company, and that it promises a reduction of 20 per cent in rates. L.

MARIANNA, FLA.—An election will be held October 20 to vote on the question of issuing $35,000 municipal bonds for an electric light plant and water works system. Address Paul Carter, mayor, for information.

OCALA, FLA.—The Council is planning ways and means of establishing an electric lighting system. Address the mayor in regard to the matter.

PALATKA, FLA.—The Coleman-Norcross Company, Chandler Building, Atlanta, Ga., has purchased the Palatka Light & Power Company and will rebuild the plant.

NORTH CENTRAL STATES.

AKRON, O.—A majority of the property owners on North Howard Street, in the business section, have presented to the Council a petition for the construction of an ornamental lighting system on that street, and indications are that it will be favorably acted upon. H. Whitford Jones is the city lighting expert. L.

CINCINNATI, O.—Edward Wilbern has purchased the old Welsh church property, in College Street, and will supervise the erection on it of a 12-story building designed for use by small manufacturers, while the basement and first floor will be fitted up for a modern garage. A large amount of power equipment, wiring, etc., will be involved in the construction of the building, in view of these purposes.

COLUMBUS, O.—John J. Miller, state superintendent of public works, is investigating the possibility of establishing hydroelectric plants on the Maumee River and the chain of lakes in Summit county.

MILAN, O.—This town has accepted the offer of the Lake Shore Electric Company to furnish current for the municipal lighting plant for about a three-cent rate. The present municipal plant is obsolete.

MT. VERNON, O.—The city solicitor is preparing an ordinance to issue bonds for constructing and equipping a municipal lighting plant. It will call for bonds in the sum of $45,000, and will be voted upon at the coming fall election. J.

NOTTINGHAM, O.—Ursuline Convent will have a power plant for which plans are being drawn by Cleveland architects. Bids will probably be opened by the Catholic diocese for apparatus.

YOUNGSTOWN, O.—H. Whitford Jones, the expert recently employed by the city to formulate a new street-lighting plan, has definitely decided the complete readjustment of the system. Where the city now uses approximately 750 arc lamps, under the contemplated system 3,750 will be used, figures being based on 100-candlepower tungsten lamps. H.

BATTLE CREEK, MICH.—The Improvement Association is planning ways and means to secure street lighting for Urbandale. Address Dr. Theodore Kolvoord.

GRAND RAPIDS, MICH.—The Division Avenue Improvement Association will start at once a campaign to raise between $16,000 and $18,000 for installing 142 boulevard lamps. Address the secretary of the Improvement Association.

MILWAUKEE, WIS.—One hundred and twenty-two additional lamps will be erected in the outlying sections of the city, and 54 modern lamps will be substituted for lamps that are pronounced out of date. Address the city electrician for desired information.

GLENWOOD, MINN.—W. H. Brink, engineer, St. Paul, Minn., is preparing estimates for the installation of a lighting plant in this city.

RED WING, MINN.—Bids will soon be asked for furnishing posts for the new lighting system. Address Chairman Back for desired particulars.

WORTHINGTON, MINN.—The villages of Round Lake, Bigelow and Rushmore have combined to secure electric power from the city plant here.

ESTHERVILLE, IOWA.—Additions to the electric light plant are to be made, involving the construction of a reinforced-concrete stack 150 feet high, 300 horsepower of boiler capacity including mechanical stokers, 400-horsepower engine, and generators, switchboard and wiring. Alternate bids will be accepted for an oil-engine installation of the Diesel type. Bids will be received until 9 a. m., August 11. J. F. Druar, 312 Commercial Building, St. Paul, Minn., is consulting engineer, and N. B. Egbert is city clerk.

IOWA FALLS, IOWA.—The Iowa Railway & Light Company is preparing to erect a plant for the purpose of supplying the city with electric light.

LE MARS, IOWA.—A movement has been started to extend the ornamental street lighting system, the estimated cost of which is $2,000.

PARKERSBURG, IOWA.—The stock of the Parkersburg Electric Light, Heat & power Company, has been acquired by the Charles City and Hampton Syndicate, which is acquiring plants in this locality. It is the intention of the company to operate a circuit of high-tension wires all over Butler, Floyd, Franklin and adjoining counties, with Charles City as the center of the system.

BIRCH TREE, MO.—W. J. Duffield has secured franchises for an electric light plant and water works. The former will be installed immediately.

KIRKWOOD, MO.—The city contemplates purchasing and installing a 150-horsepower boiler and smoke-stack, two generators, 100-kilavolt ampere and 200-kilavolt ampere respectively; generators and engines, directly connected, with exciter and two generator panels. Address W. A. Trussell, superintendent.

PATTONSBURG, MO.—The city has voted to issue $10,000 in bonds to construct an electric light plant. Address the mayor for particulars.

MONTROSE, MO.—Montrose voters

decided at a special election to issue bonds for an electric light plant.

NELICH, NEB.—Plans have been prepared for improvements and enlargement of the electric-light plant. J. Y. Spirk is engineer.

SALINA, KANS.—The Salina Light, Power & Gas Company will extend the capacity of its plant. J. E. Harsh is manager. M.

SOUTH CENTRAL STATES.

HOPKINSVILLE, KY.—In connection with franchises for electric railways to operate here and in the surrounding districts of Christian County, provision is made also for the manufacture and sale of electricity for general purposes. R. E. Cooper and J. H. Bell, local business men, have been prime movers in the movement and say they represent an Eastern syndicate which is prepared to buy the franchise and commence actual construction shortly afterward. G.

CHATTANOOGA, TENN.—A contract for lighting the city's streets with Mazda lamps has been let to the Chattanooga Railway & Light Company. The contract will mean a saving of about $10,500 a year to the city and the substitution of the new type of lamps for the arc lamps now in use. G.

WESTERN STATES.

FORT BENTON, MONT.—Bids for the purchase of $17,000 in bonds, to be used in the construction or purchase of a municipal electric light plant for this city, will be received until August 17, by John F. Murphy, city clerk. O.

HAVRE, MONT.—The City Council has passed a resolution of intention of the installation of an ornamental system of street lighting on Third Street, the district to be known as Improvement District 198. The city clerk will shortly receive bids for materials and installation.

LIVINGSTON, MONT.—An ornamental lighting system will soon be established. Address Mayor Veit for general information.

DURANGO, COLO.—The western slope of the Rockies from Durango to Grand Junction is to be gridironed with hydroelectric power lines for the development of that section of the state as a result of a consolidation of a number of Colorado companies according to information given out by semi-official sources. The Western Colorado Power Company, the Colorado division of the Utah Power & Light Company, has taken over the plants of the Ouray Electric Light & Power Company and the companies operated at Ridgway and Delta. These are to be connected with the plants formerly belonging to the Telluride Power Company, the San Juan Water & Power Company, the Durango Gas & Electric Company, and the Telluride Electric Light Company, all of which are owned by the Western Colorado Power Company.

SALMON, IDAHO.—The Gilmore Mining Company, operating near this city, is interested financially in the installation of a new power plant on the Salmon River. It is reported work of construction will be started during the year. O.

RENO, NEV.—The Portneuf Power Company has filed articles of incorporation here with a capital stock of $100,000 for the purpose of acquiring and selling electric power for lighting, heating and other purposes. The incorporators are A. D. Ayres, D. C. Papson and E. C. Dalzel.

NOGALES, ARIZ.—Application has been made by the Nogales Electric Light, Ice & Water Company for an electric light and power franchise in this city.

OROVILLE, WASH.—All title and interest in the present electric power site and plant at Similkameen Falls, on the Similkameen River, owned by the power company of that name, has been taken over by the Okanogan Valley Electric Company. The new company is backed by Eastern capital, and extensive improvements will be made to the plant at once. Electrical machinery capable of developing 2,000 horsepower will be installed. O.

RIDGEFIELD, WASH.—Work on the construction of a light and water system in this city will be started in the immediate future by J. H. Cunningham, of Portland, who was recently granted a franchise.

SEQUIM, WASH.—A steam heating and electric light plant, to furnish heat and light to this city, will be installed by J. L. Keeler in the near future.

HILLSBORO, ORE.—The power house and distributing station, owned and operated by the Hillsboro Power & Investment Company, was totally destroyed by fire recently. The greatest damage will result from the loss of the engines, boilers, and dynamos. No insurance was carried, but it is understood the plant, which was valued at between $20,000 and $25,000, will be rebuilt at once. H. B. Gates, owner of water power plants at Dallas, Heppner, and other small towns in the state, is the owner of the local plant. O.

NEHALEN, ORE.—A municipal light plant has been provided for by a vote of the people. Address the city clerk.

LOS ANGELES, CAL.—One million dollars to construct additional distributing lines in Southern California is a proposed expenditure, according to an application to issue stocks and bonds which the Pacific Light and Power Corporation has filed with the State Railroad Commission.

REDLANDS, CAL.—Steps are being taken by the Redlands City Trustees looking toward an electric distributing system. The contract for street lighting expires December 1 and the trustees are conferring with officials of the Edison and Southern Sierras Companies, also with the managers of Riverside and Pasadena municipal plants in regard to a municipal distributing system.

PROPOSALS.

CABLE.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until August 3 for furnishing 1,800 feet of 106,000-circular-mil, armored and served duplex rubber-insulated lead-sheathed cable. For further information address Joseph E. Kuhn, lieutenant colonel of engineers.

CABLE.—Sealed proposals will be received at the office of the General Purchasing Officer, Panama Canal, Washington, D. C., until August 3, under circular 862-B, for furnishing plow steel galvanized cable. For further information address F. C. Boggs, major, corps of engineers, United States Army, general purchasing officer.

ELECTRIC WIRING—Sealed proposals will be received by the Board of Education, Kansas City, Mo., until August 6 for the installation of heating and ventilating apparatus, electric wiring and other work in the new Milton Moore school. J. H. Brady, Finance Building, has the plans. James B. Jackson, Jr., is secretary of the Board. M.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the City of Chicago, Ill., until August 8, by the undersigned at room 406 City Hall, for furnishing and installing electrical equipment for a double-leaf trunnion bascule bridge over the north branch of the Chicago River, according to plans and specifications. L. E. McGann, commissioner public works.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received at the office of the U. S. Marine Corps, Quartermaster's Department, Depot of Supplies, 1100 South Broad Street, Philadelphia, Pa., for furnishing and installing one 60-kilovolt-ampere synchronous motor, direct connected to a three-wire 125 to 250-volt 85-kilowatt generator. For further information address Cyrus Radford.

ELECTRICAL EQUIPMENT.—Sealed bids will be received until August 4 for improvements to water system in Galva, Iowa, including one 50-horsepower internal-combustion engine, generator, and motor-driven duplex pump. Plans and specifications can be had on application to E. L. Snyder, Electric Engineering Company, Sioux City, Iowa. I. E. Baumgardner is city clerk of Galva.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 26 for furnishing the lighting fixtures of a one-story building for the post office at Tupelo, Miss.; and until September 2 for the same for a two-story building for the post office at Fulton, Ky., in accordance with drawings and specifications, copies of which may be obtained either from the custodians of the sites named or the office of the Supervising Architect.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 11 for furnishing the following electrical equipment, as per schedules given and for delivery at Navy Yards named: Annual supply of insulators with metal inserts and sheet-molding insulating material, 7705, Brooklyn, N. Y.; until August 18 for: 2,294 feet cable, cambric, varnished, lead-covered, single-conductor, 800,000 centimeters, 7104, Newport, R. I.; 272 interior switch and receptacle fittings and interior for switches, 7095, Charleston, S. C.; 770 fuses, plug, and inclosed cartridge type; 150 pounds uncut mica, grade A-1; 20,000 feet lighting and power wire, rubber-insulated, single, solid, for 660 volts; 6,400 feet wire, twin-conductor, plain, 60,000 centimeters, all 7095, Brooklyn, N. Y.; until August 25 for: 650 fuses, inclosed, and plug cut-out, 7099, Mare Island, Cal.; 26 three-horsepower 230-volt turret-turning motors and equipment, and spare parts, 7081, Brooklyn, N. Y.; 6,500 condenser and evaporator tubes, 7099, Mare Island, Cal.; one anchor windlass with two 230-volt direct-current motors and spare parts, 7082, Brooklyn, N. Y.

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Custom-house, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Custom House, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

NO. 13,423. ELECTRIC COMMERCIAL CARS.—A telegram has been received from an American consular officer stating that a responsible person in his district desires the sole representation of American firms manufacturing electric commercial cars not represented in the country in question. Cable quotations are desired on cars of 1, 2, 3, and 4 tons, with discounts, etc.

NO. 13,424. CRANES.—The Agent General for Victoria, Australia, invites tenders for the supply and delivery at the port of Melbourne, fully inclusive of Australian customs duties, etc., of the following electric cranes: Eight 50-ton electric overhead traveling cranes, one 30-ton electric overhead traveling crane, three 10-ton overhead electric traveling cranes. Specifications, conditions of contract, and forms of tender may be obtained at the offices of the consulting engineers, John Coates & Co. (Ltd.), 115 Victoria Street, London, SW., England. Tenders will be received until August 26.

NO. 13,445. ELECTRIC MOTORS FOR TRAMCARS.—A mechanical engineer in a foreign country recently called upon an American consular officer and stated that he was authorized to secure bids on electric motors and appurtenances for 80 tramcars, for which a certain municipality is in the market. General and technical conditions relating to the supply of these motors have been forwarded by the consular officer and will be loaned to interested firms by the Bureau of Foreign and Domestic Commerce. The goods must be delivered in February, 1915.

FINANCIAL NOTES.

Judge Hazel in the United States District Court has upheld the directors and majority stockholders of the United States Light & Heating Company in the receivership of that corporation by ordering the answer of Henry A. Ackerman stricken out and vacating the appointment of receivers in the action which was brought by the Picher Lead Company. Simultaneously, he appointed James O. Moore, of Buffalo, and James A. Roberts, of New York, receivers in a new action brought by the Central Trust Company of New York, which holds $200,000 of the company's notes. The Central Trust Company is not antagonistic to the existing control of the United States Light & Heating Company. The plaintiffs in the other receivership proceeding, Henry A. Ackerman and G. M. Walker, who were appointed receivers at the outset of the Picher Lead Company's action, were removed last week. Moore is the only holdover of the three appointed then. He was the court's nominee.

The Westinghouse Machine Company has received a contract from the Edison Electric Illuminating Company of Brooklyn, N. Y., for one of the largest steam turbines of the single-unit type that has ever been constructed. This machine will have a capacity of 32,000 horsepower, and it will be utilized for the generation of electric current to furnish electric light and power to the city of Brooklyn. The company some time ago received a contract for two similar turbines from the New York Edison Company, one of which has already been shipped.

For the week ended July 11, electric properties operated by H. M. Byllesby & Company reported a net gain in connected business of 3,237 horsepower, of which 2,000 horsepower was for the Booth-Kelly Lumber Company, at Springfield' Ore., to be supplied by the Eugene division of the Oregon Power Company. New business contracted for during the week, but not connected, included 766 customers with 403 kilowatts of lighting and 346 horsepower in motors. Output of the electric properties for the week showed a gain of 10.5 per cent over the corresponding week of 1913.

Directors of the Cleveland Electric Illuminating Company have voted to increase the outstanding common stock of the company by 10 per cent. At present there are $8,803,200 common stock outstanding so that the new stock would amount to $880,320. Both common and preferred shareholders have the privilege of subscribing for the new stock at par on the basis of one share of new stock for every ten shares held. No fractional shares will be issued. The Central States Electric Corporation, the holding company, owns about 75 per cent of the Cleveland Company's stock and its share will amount to approximately $660,000. When the stock of the Cleveland Company was increased in July, 1913, the holding company did not subscribe but sold its warrants. This time the Central States Company will take its participation and will finance it by the sale of notes.

The General Electric Company has been awarded the contract for 27 big transformers, to cost about $110,000, for the City Railway Company of London. It recently completed the last work on a $1,000,000 contract for transformers and other apparatus for the Mississippi Power Company. Orders for small transformers and other apparatus are beginning to pick up, according to one of the officials of the company.

Alabama Traction Light & Power Company for May reports gross earnings from operation of subsidiaries of $30,290 for May, 1914, with net earnings of $10,221. For the twelve months ended May 31, 1914, gross earnings were $375,239 and net earnings $129,798. As the company is now delivering power regularly from the new hydro-electric development at Lock 12 on the Coosa River, it is expected to begin publication of earning statements showing the combined earnings from all sources, instead of showing only the earnings from the smaller operating subsidiaries as at present.

Dividends.

	Term.	Rate.	Payable.
Bangor Ry. & Elec. Co.	2	0.5%	Aug. 15
Ill. Trac. Co.	2	0.75%	Aug. 15
Kaninistiqua P. Co.	2	1.5%	Aug. 15
Ill. & Pow. Sec. Co.	2	1.75%	Aug. 15

Reports of Earnings.

WISCONSIN EDISON COMPANY.

The Wisconsin Edison Company, Inc., reports earnings of subsidiary companies for the six months and twelve months ended June 30, 1914:

	1914	1913
Six mos. gross	$4,330,472	$4,134,674
Net after taxes	1,652,850	1,541,216
Bal. after int. & divs. on secur. not owned	825,820	787,887
Approp. for dep.	408,131	353,714
Twelve mos. gross	8,752,205	8,244,020
Net after taxes	3,589,232	3,327,325
Bal. after int. & div. on secur. not owned	2,018,921	1,848,337
Approp. for depr.	839,800	730,362

MANILA ELECTRIC & LIGHTING CORPORATION.

	1913	1912
Gross earnings	$1,698,593	$1,597,674
Oper. exp. & txs.	790,786	724,486
Net earnings	907,806	873,187
Fixed charges	277,617	277,500
Surplus	630,190	595,687
Reserves	108,250	.....
Dividends	350,000	.....
Net surplus	171,940	.....

LEHIGH VALLEY TRANSIT.

	1914	1913
June gross	$ 176,469	$ 148,221
Net after taxes	98,272	73,178
Surp. after charges	40,576	26,660
Twelve mos. gross	1,841,441	1,661,961
Net after taxes	943,531	835,780
Surp. after charges	286,823	301,190

SOUTHWESTERN POWER & LIGHT.

	1914	1913
June gross	$ 224,089	$ 174,149
Expenses and taxes	122,759	93,008
Net earnings	101,330	81,141
Twelve mos. gross	2,544,724	2,087,973
Expenses and taxes	1,349,913	1,167,784
Net earnings	1,149,811	920,189

COLUMBIA GAS & ELECTRIC.

The combined earnings of the Columbia Gas Electric Company and the Union Gas & Electric Company for the six months ended June 30, 1914, were:

	1914	1913
Gross earnings	$3,582,609	$3,293,733
Net earnings	2,157,561	1,914,908
Balance after ren. ap. to int.	866,329	567,163

TEXAS POWER & LIGHT.

	1914	1913
June gross	$ 129,172	$ 89,215
Net after taxes	45,723	35,343
Surp. after charges	30,129	18,827
Twelve mos. gross	1,142,631	1,074,891
Net after taxes	493,059	417,433
Surp. after charges	241,323	263,834
Bal. aft. pf. div.	109,635	164,346

FORTH WORTH POWER & LIGHT.

	1914	1913
June gross	$ 72,637	$ 48,763
Net after taxes	34,932	29,473
Surp. after charges	25,813	22,340
Twelve mos. gross	797,858	572,192
Net after taxes	442,187	311,652
Surp. after charges	345,214	239,639
Bal. aft. pf. div.	283,828	196,239

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 27	July 20
American Tel. & Tel. (New York)	119½	118⅞
Commonwealth Edison (Chicago)	135	136
Edison Electric Illuminating (Boston)	249	249½
Electric Storage Battery common (Philadelphia)	51½	50¾
Electric Storage Battery preferred (Philadelphia)	50	50¾
General Electric (New York)	146	147½
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	10¼	10
Massachusetts Electric preferred (Boston)	58	58
National Carbon common (Chicago)	116	116½
National Carbon preferred (Chicago)	120¼	120¾
New England Telephone (Boston)	130	130
Philadelphia Electric (Philadelphia)	24½	24⅞
Postal Telegraph and Cables common (New York)	80	80⅝
Postal Telegraph and Cables preferred (New York)	67	67
Western Union (New York)	58¼	58
Westinghouse common (New York)	77½	77½
Westinghouse preferred (New York)	122	122

NEW INCORPORATIONS.

JAMESTOWN, N. D.—Ellendale Electric Company has been incorporated with a capital stock of $20,000 by John H. Canham, Clarence Alm and George Phillips.

HOUSTON, TEX.—Barden Electric & Construction Company has been incorporated with a capital stock of $10,000 by Ed. T. Barden, R. L. Jacobs and W. T. Boyd.

WEST BADEN, IND.—The French Lick & West Baden Water, Light, Heat & Power Company has been incorporated. Thomas Taggart is president of the company.

ARKPORT, N. Y.—The Almond Bishopville & Arkport Telephone Company has been incorporated with a capital stock of $250,000 by Z. H. Wyant, S. E. Cridler and others.

BOYNTON, UTAH.—Boynton Gas & Electric Company has been incorporated with a capital of $5,000 byJohn R. Harris, Fayetteville, Ark.; J. H. Ogle, Boynton; Urie D. Harris, Muskogee.

BUTLER, IND.—The Butler Utilities Company has been incorporated with a capital stock of $25,000 to furnish water, light, heat and power. The incorporators are C. M. Lott, W. F. Shumaker and E. A. Farnham.

YONKERS, N. Y.—The Gronbech Electric Company, Incorporated, has been granted articles of incorporation to engage in electric contracting, equipment, etc. The incorporators are Anton B. Gronbech, Charles A. Ericson and L. Meade Storer, all of this place.

PERSONAL MENTION.

MR. FRANK A. DRISCOLL has joined the forces of the Best Electric Company at Pittsburgh, Pa., and will travel the Middle West and New York State. Mr. Driscoll, who was formerly with Pass & Seymour Company, Inc., Solvay, N. Y., has a large circle of friends in the industry and will prove a very valuable man in his new connection.

MR. HARRY D. FRUEAUFF, manager of the City Light & Traction Company, of Sedalia, Mo., joined the ranks of benedicts on July 21, wedding Miss Lena L. Russell, also of Sedalia. The ceremony was performed at Jefferson City. Mr. and Mrs. Frueauff spent their honeymoon in St. Louis, and will be at home in Sedalia after August 1.

MR. FRANK R. SCHALCK has been appointed managing director of the New York Electrical School of Chicago, located at 936-944 North Chicago Avenue. The school is operated by the New York Electrical School, which has had a remarkably successful career in New York City in educating artisans in the theory and practice of electricity and magnetism. Mr. Schalck was for many years associated with the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN as chief of the out-door subscription department. During his work with this publication, Mr. Schalck has visited practically every city and town of importance in every state in the Union. He is thoroughly familiar with every branch of electrical work, and has a wide acquaintance among electrical men in every department of the industry. Mr. Schalck is not only equipped with a very intimate knowledge of the business and the requirements of the young men preparing for an active career in electrical work, but he is possessed of executive ability of a high order, and he is eminently fitted to represent the school in his present capacity.

MR. NAT W. LILLIE recently severed his connection with the New England Telephone & Telegraph Company of Boston, of which he was purchasing agent, after 37 years in the telephone business. Mr. Lillie is now residing at Laconia, N. H., on his farm. Mr. Lillie was one of the oldest officials of the telephone industry having entered the telephone business in 1877, first being associated with E. T. Holmes in Boston, when the telephone was introduced as a medium for sending for express wagons. Later he was associated with the Lowell Telephone Syndicate, serving as secretary to L. N. Downs, general manager, and when the New England Telephone & Telegraph Company was organized in 1883 he continued as secretary to Mr. Downs, the general manager, and later as secretary to J. N. Keller, in the same office. In 1886 Mr. Little was appointed purchasing agent and superintendent of the supply department of that company, succeeding George T. Manson (now of the Okonite Company, New York City), and remained in this position until he retired a short time ago. As indicating the growth of the supply department of this company during his term of office, it is estimated that purchases in 1886 amounted to twenty-five or thirty thousand dollars annually, while between four and five millions were the purchases annually for this company during recent years.

Nat. W. Lillie.

MR. ARTHUR E. LOEB has been endorsed as the candidate for the thirteenth Jovian Congress of the Jovians of Central Ohio and the Columbus Jovian League. Mr. Loeb is vice-president of the Avery-Loeb Electric Company, Columbus, O., Past-Statesman for Columbus, and by his energy and hard work has done much to place the Jovians of Columbus on a solid basis. He is one of the originators of the "Columbus Co-operative Store," a considerable discussion concerning which has recently been attracting attention in Jovian circles. The Columbus Jovian League Committee includes W. A. Hopkins, L. A. Sackett, Prof. F. C. Caldwell, Oscar Avery, L. W. Jaquith, W. A. Shoemaker, D. W. Morris, M. A. Pixley, V. G. Eastman

OBITUARY.

MRS. J. W. LAYNE, wife of a well known Missouri telephone man, died at Nevada, Mo., recently, following a stroke of paralysis. Mr. Layne formerly was president of the Home Telephone Company, of Carthage, Mo., besides being heavily interested in a similar company at Joplin.

MR. HENRY C. VANCE, 46 years old, general manager of the Empire City Subway Company of New York dropped dead on July 20 at the home of his brother, Wilson J. Vance, 85 Millington Avenue, Newark. Acute indigestion brought on a stroke of apoplexy, which caused death a few minutes after he was stricken. Mr. Vance lived at 758 De Graw Avenue, in the Forest Hill section of Newark. He was staying at the home of his brother, who is private secretary to Mayor Henry Haussling of Newark, because it is close to a private hospital in which his wife underwent an operation two weeks ago. Mrs. Vance was to leave the hospital yesterday and be taken to the home of her brother-in-law.

DATES AHEAD.

Southeastern Section, National Electric Light Association. Annual convention, Isle of Palms, Charleston, S. C., August 19-21. Secretary, A. A. Wilbur, Columbus, Ga.

American Peat Society. Annual meeting, Duluth, Minn., August 20-22. Secretary, Julius Bordello, 17 Battery place, New York, N. Y.

New England Section, National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont street, Boston, Mass.

Pennsylvania Electric Association. Annual convention Eagles Mere, Pa., September 8-11. Secretary, S. E. Pohe, Bloomsburg, Pa.

Northwest Electric Light & Power Association. Annual convention, Spokane, Wash., September 8-11. Secretary, Norwood W. Brockett, Puget Sound Traction, Light & Power Company, Seattle, Wash.

American Institute of Electrical Engineers. Pacific Coast convention, Spokane, Wash., September 9-11. Secretary, F. L. Hutchinson, 29 West Thirty-ninth street, New York, N. Y.

Electrical Supply Jobbers' Association. Regular quarterly meeting, Clifton Hotel, Niagara Falls, Canada, September 9-11. General secretary, Franklin Overbagh, 411 South Clinton street, Chicago.

Association of Edison Illuminating Companies. Annual convention, White Sulphur Springs, W. Va., September 14-17. Secretary, George C. Holberton, San Francisco, Cal.

Association of Iron and Steel Electrical Engineers. Annual convention. Cleveland, O., September 14-19. Secretary, W. T. Snyder, McKeesport, Pa.

Old-Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps. Thirty-third annual reunion, Kansas City, Mo., September 15-17. Secretary of Old-Timers, F. J. Scherrer, 30 Church street, New York. Secretary, Military Telegraph Corps. David Homer Bates, 658 Broadway, New York.

International Association of Municipal Electricians. Annual convention, Atlantic City, N. J., September 15-18. Secretary, C. R. George, Houston, Tex.

Illuminating Engineering Society. Annual convention, Cleveland, O., Septem-

ber 21-25. Secretary, Joseph D. Israel, 1000 Chestnut street, Philadelphia, Pa.

American Electrochemical Society. Twenty-sixth general meeting, Niagara Falls, N. Y., October 1-3. Secretary Joseph W. Richards, South Bethlehem, Pa.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 12-16. Secretary, E. B. Burritt, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Annual congress, St. Louis, Mo., October 14-16. Mercury, Ell C. Bennett, Syndicate Trust building, St. Louis, Mo.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual reunion, Richmond, Va., October 29-30. Secretary, Henry W. Pope, New York City.

With the Electrical Manufacturers

Transmission Engineering Company, Pittsburgh, Pa., has issued a four-page publication giving data on outdoor substations, including costs and operating expenses.

The National Conduit & Cable Company, New York City, has recently issued a pamphlet summarizing the conditions of the copper industry and the copper market during the last few months.

The Electric Storage Battery Company, Philadelphia, Pa., has received an order from the Puget Sound Traction, Light & Power Company, Seattle, Wash., for 34 Ironclad-Exide batteries of three cells each. These batteries are to be used for lighting the cable cars operated by the traction company.

The Howland Publishing Company, 6 Church Street, New York, N. Y., has published a handbook edition of its comprehensive catalog of electrical supplies. The idea is to make available in compact form an illustrated, descriptive price list of leading electrical material for the use of jobbers and dealers in electrical merchandise. The book is well arranged and well printed, and should find a considerable application throughout the industry.

Manhattan Electrical Supply Company, Chicago, Ill., has recently issued a handy set of curves for laying out circuits and determining wire capacity in accordance with Rule No. 23*d* of the Electrical Code of the city of Chicago. This rule requires a sufficient number of circuits in new installations to allow for at least one watt per square foot of floor area. By locating the crossing point of ordinate and abscissa corresponding to a room's dimensions the number of circuits required is indicated by the nearest curve on the curve sheet. The folder containing the curves will be mailed free upon request.

Safety Insulated Wire & Cable Company, New York City, has recently issued bulletin No. 200 entitled "Safety Steel-Taped Cable." This bulletin is printed in two colors, contains 48 pages and 59 illustrations. The numerous illustrations show not only completed installations of Safety Steel-Taped cable but also practical news and progress photographs illustrating the actual operations of installation under a wide variety of conditions. A description of the cable is first given, being followed by a discussion of its many uses and applications. A comparison of the costs of a Safety Steel-Taped cable installation and several types of conduit installations is given.

The New York Electric Lamp Company, 38 Park Row, New York, N. Y., has been organized by Ernest W. Boyce, to take over the sales organization, unexpired contracts, etc., of the New York Incandescent Lamp Company, of 134 West Fourteenth Street. Mr. Boyce has been associated with the New York Incandescent Lamp Company as its general manager from its inception. He has always given his personal attention to the sales department of the company. The new organization will continue to serve its patrons with "Regent" drawn-wire tungsten, "Best" Class A carbon, and "Regenerated" guaranteed refilled carbon lamps.

The Niagara Searchlight Company, Niagara Falls, N. Y., manufacturer of "Niagara" metal-case flashlights, has transferred its sales office to New York City, having appointed A. Hall Berry, 97-99 Warren Street, exclusive general sales representative. The company is manufacturing a complete line of all-metal tubular flash-light cases, electric helmet or cap and hand lights for fire departments, mining engineers, etc., cap lights for bands, police department flash-light night sticks and hand lamps, motor boat and motorcycle searchlights, hunters' and campers' searchlights, etc. The company is also designing new and attractive devices for flash-light battery service.

H. W. Johns-Manville Company, New York, N. Y., has recently established a lighting division in its engineering department. This new division will have charge of Frink and J-M Linolite systems of lighting, and will enlarge the scope of the company's business and service in lighting fixtures in general, by the addition of many new lines. This development now enables the Johns-Manville Company to handle lighting propositions of every size and character. Sales will be under the direction of Edward L. Cox, manager. Mr. Cox is well known in the trade through his long connection with the Enos & Watkins Company. G. E. Villaret, who has had wide experience abroad and in this country, will have charge of designs. The new division will be prepared to furnish from stock, designs in brackets, pendants, hangers, ceiling fixtures, glassware, etc., to meet practically all requirements. Where special fixtures are desired, the company's long experience and extensive manufacturing facilities, coupled with the service of Mr. Villaret in designing are available.

The Electric Economy Company, Hyde Park, Mass., has ready for distribution several bulletins relating to a new type of electrolytic rectifier, rectifying sets for charging electric vehicle batteries from alternating current, and a catalog of electrical apparatus for operating signal line systems and for charging storage batteries. Copies of these bulletins, which are respectively R 6114, E V 7114, and C 4114, will be sent to those interested, upon request.

Hubbard & Company, Pittsburgh, Pa., manufacturers of pole-line hardware and Pierce construction specialties, has issued a very interesting announcement to the trade. The business of the company for the first four months of the present year ran somewhat behind 1913 sales. Since the first of May the sales have steadily increased, and in June exceeded the corresponding month of last year. The sales for July show a remarkable advance. The company makes this announcement to save some of its friends from experiencing again the difficulties met with in the spring of 1913, when premiums were paid for prompt deliveries of steel and other commodities. With the present favorable outlook for an intense business development, it is quite probable that considerable advance in prices will shortly ensue, and difficulties in securing prompt shipments will be upon us before the rush condition is realized.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces that it has recently supplied the following apparatus to metal mines: August Mining Company, Landusky, Mont., three 75-kilovolt-ampere, 11,000-volt transformers; one electrolytic lightning arrester; one complete switchboard equipment; one 125-horsepower motor for tube-mill drive; one 35-horsepower motor for driving rolls; one 25-horsepower motor for driving crusher; one 15-horsepower motor for belt conveyor; one 10-horsepower motor for air compressor for agitator; two 7.5 horsepower motors for triplex plunger pumps; one 3-horsepower motor for placer firer; four 7.5-horsepower slow-speed motors for slime pumps; complete line material for 23,000-volt transmission line; two four-kilovolt-ampere lighting transformers. Anaconda Copper Mining Company, Great Falls, Mont., four 30-horsepower motors with brakes to control gate valves in air line supplying blast to copper fur-

naces; same company, Butte, Mont., three 3.5-ton, 250-volt barsteel locomotives (duplicates of locomotives previously furnished this customer, making approximately the fifth repeat order for this class of machine); four 7.5-horsepower motors for fans; one 25-horsepower motor with double extended shaft for pump; three 5, one 10, one 50 and one 100-horsepower motor for new leaching plant at the Washoe smelter. International Smelting & Refining Company, for a new copper smelter at Miami, Ariz., seven 50-horsepower back-geared mill motors with magnetic brakes for operating converters; two 150-horsepower motors for belt driving rolls and crushers; two 25-horsepower back-geared mill motors for matte-casting machines; ten mill motors with brakes and magnetic control; same company, for sintering plant at Tooele, Utah, two 10-horsepower motors; two 3-horsepower adjustable-speed, commutating-pole motors with drum controllers; two 5-horsepower motors; one 75-horsepower motor; also one motor-generator set, switchboard and regulating devices for Cottrell fume-deposition process. Ray Consolidated Copper Company, Hayden, Ariz., 16 10-horsepower special slow-speed vertical motors for driving agitators for oil floatation process. Utah Copper Company, Magna, Utah, seven 10-horsepower special slow-speed vertical motors, for driving similar agitators. Daly West Mining Company, Park City, Utah, one 300-horsepower 2,200-volt hoist motor with liquid controller and complete switchboard equipment. Alaska Gastineau Mining Company, Juneau, Alaska, one six-ton storage-battery locomotive; one 50-kilowatt motor-generator set. Empire Mines & Investment Company, Grass Valley, Cal., one 500-horsepower motor with liquid controller for double-drum hoist; three 200-kilovolt-ampere, 4,000-volt transformers; one three-phase, 45-kilowatt induction regulator; six 35-horsepower special back-geared stamp-mill motors; control equipment with switchboard apparatus and a number of special safety devices. Calumet & Arizona Mining Company, Bisbee, Ariz., two 300-kilowatt, three-phase transformers and switchboard.

Record of Electrical Patents.

Issued by the United States Patent Office, July 21, 1914.

1,103,954. Electric-Motor Controller. H. E. Frost, assignor to Electric Controller Mfg. Co., Cleveland, O. A solenoid-controlled electric starter with hand-operated controller.

1,103,959. Electric Control System. J. H. Hall, assignor to Electric Controller & Mfg. Co. A solenoid-operated reversing controller for motors.

1,103,983. Protective Device for Sheathed Conductors. T. E. Murray, New York, N. Y. A sleeve for covering conductor where metal sheath of conductor has been removed.

1,103,984. Protective Casing for Line Conductors. T. E. Murray. A metal casing for electrical conductors.

1,104,009.—Insulator.

1,103,987. Electric Fuse. T. E. Murray. An inclosed fuse.

1,103,989. Electric Cutout. T. E. Murray. A cutout having a switch permitting it to be used on either side of three-wire system.

1,103,990. Electric Cutout. T. E. Murray. A modification of 1,103,989.

1,103,991. Connecting Device. T. E. Murray, New York, N. Y. A plug socket.

1,103,994. Electric Cutout. T. E. Murray. A cutout for a three-wire system.

1,104,007. Interrupter for Electric Ignition-Machines. M. Schafer, assignor to The Firm of Robert Bosch, Stuttgart, Germany. An inclosed vibratory interrupter.

1,104,009. Insulator. E. Seguin, Montreal, Canada, assignor of one-half to E. J. Parsons. A suspension insulator, the insulating part joining two hollow tubes. (See cut.)

1,104,032. Spool for Electromagnets. C. J. Anderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Angle strips form barrel of spool.

1,104,038. Lightning-Arrester. G. P. A. Damschen, Oconomowoc, Wis. Electrodes mounted on block forming air gap to ground.

1,104,061. Cable and Method of Forming and Connecting the Same. F. R. McBerty, assignor to Western Electric Co. A fabric-insulated ribbon of conductors for telephone exchanges.

1,104,062. Wiring System for Telephone Exchanges. F. R. McBerty, assignor to Western Electric Co. A telephone selector using cable covered by No. 1,104,061.

1,104,065. Detector for Wireless Apparatus. B. J. Miessner, Washington, D. C. Covers spring adjustment for a crystal detector utilizing metallic point.

1,104,073. Detector for Wireless Telegraphy and Telephony. G. W. Pickard, Amesbury, Mass., assignor to Wireless Specialty Apparatus Co., New York, N. Y. Contact member of platinum and gold.

1,104,077. Electromagnetic Circuit-Controlling Device. W. F. Smith, Brooklyn, N. Y., assignor to Western Electric Co. A relay magnet.

1,104,104. Trolley Guide. E. H. Cauvel, Oil City, Pa. A horned guide for trolley wheel.

1,104,115. Carbon Brush. R. F. Hausen, assignor to Pittsburgh Carbon Brush Co., Pittsburgh, Pa. A screw contact is formed between brush and conductor.

1,104,159. Spark-Plug. W. S. Witter, Toledo, Iowa. Covers details.

1,104,165. Automatic Wireless Train-Control Apparatus. T. E. Clark, Detroit, Mich. Utilizes tracks and wire parallel to tracks.

1,104,176. Bearing for Electric Meters. P. Eibig, assignor to General Electric Co. An oil bearing for upper part of meter pivot.

1,104,183. Alternate-Current Generator. V. A. Fynn, London, England. A commutator alternator requiring auxiliary alternator.

1,104,184. Dynamo-Electric Machine. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. A modification of 1,104,183.

1,104,194. Electric Switch. R. Ishiyama, Seattle, Wash. A time switch.

1,104,195. Switchboard Plug. M. A. Janes, Northfield, Mass. Covers details.

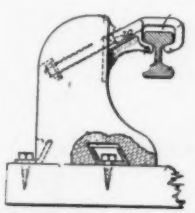
1,104,198. Vapor Electric Apparatus. O. O. Kruh, assignor to General Electric Co. A mercury-arc rectifier system using two tubes.

1,104,202. Adjustable Electric-Light Chandelier. M. J. Lindahl, Woodburn, Ore. A telescopic chandelier.

1,104,220. Third-Rail Support. W. B. Potter, assignor to General Electric Co. A hook device for supporting a third rail. (See cut.)

1,104,225. Electric Conductor for Trolley-Cars. J. Scott, Cleveland, O. A channel-shaped guard is provided for conductor.

1,104,233. Dynamo-Electric Machine. W. Weiler, assignor to General Electric Co. A separately excited generator with means for increasing magnetic time lag of exciter.



1,104,220.—Third-Rail Insulator.

1,104,256. Apparatus for and Method of Receiving Electric Waves. R. Goldschmidt, Darmstadt, Germany. An asynchronous transformer for receiving wireless signals and reducing their frequency before passing to receiver.

1,104,257. High-Frequency Generator. R. Goldschmidt, Darmstadt, Germany. Has single-phase windings and a resonant motor circuit.

1,104,268. Weighing Mechanism. E. H. Messiter, assignor to Weigher Patent Co., New York, N. Y. A special motor gives desired indication, being controlled through a resistance.

1,104,272. Apparatus for Treating Battery Plates. G. H. Rabenalt, assignor to Gould Storage Battery Co. A die for hardening plates of storage batteries and increasing their surface.

1,104,273. Process of Treating Bat-

tery-Plates. G. H. Rabenalt, assignor to Gould Storage Battery Co. A modification of 1,104,272.

1,104,279. Electrical Train-Controlling System. J. H. Schroeder and C. D. Baucom, Savannah, Ga. Contact ramps provided at ends of blocks to operate signals.

1,104,282. Electromechanical Action for Musical Instruments. M. L. Severy, Arlington Heights, and G. B. Sinclair, Medford, Mass. Covers details.

1,104,339. Flaming-Arc Lamp. S. H. Blake, assignor to General Electric Co. Covers details of arrangement and supports for downwardly projecting electrodes.

1,104,345. Self-Winding Clock. M. Castel, Iron Mountain, Mich. A weight-driven clock which is automatically wound by an electric motor.

1,104,395. Suspenion-Box Fitting for Electric Installation. W. H. Vibber, New London, Conn. A conduit outlet box. (See cut.)

1,104,419. Liquid-Controlled Alarm Apparatus. S. A. Glynn and B. L. Quayle, East Ely, Nev. An electric-contact arrangement for use in filling vessels.

1,104,436. Connector. J. F. Menningen, assignor to Allis-Chalmers Mfg. Co. A plug connector.

1,104,439. Automatic Circuit-Breaker. J. L. Mitchell, Santa Paula, Cal. Ordinary knife switch is tripped by electromagnet.

1,104,440. Electric-Current Indicator. O. Moessner, Oscar Moessner, New Haven, Conn., administrator of said Otto Moessner, deceased. Electric-light indicator.

1,104,451. Telephone Automatic Trunk-Selecting System. M. Setter, assignor to Automatic Electric Co., Chicago, Ill. A metallic wiper designed to transverse trunk terminals.

1,104,464. Ratchet Mechanism. A. H. Adams, assignor to Western Electric Co. An electromagnet ratchet mechanism.

1,104,474. Dosing Device for Controlling the Flow of Sewage to Sprinkling Filters. C. B. Buerger, New York, N. Y., assignor of one-half to M. L. Bayard. A float-switch controlled motor governing valves, etc.

1,104,499. Electric Heating Device. J. A. Heany, Washington, D. C. Has electric heating coil imbedded in material of high hysteretic properties.

1,104,522. Automatic Ignition System for Gas Lights. J. W. Lundahl, Thomaston, and O. A. Ekstrom, Litchfield, Conn., assignors of one-half to said Lundahl, one-fourth to said Ekstrom, and one-fourth to C. A. Larson. Covers details.

1,104,571. Manufacture of Metallic Filaments for Electric Incandescent Lamps. J. A. Scoular, assignor to Dick, Kerr & Co., Ltd., London, Eng. Tungsten power mixed with viscuous solution of sodium silicate before squirting.

1,104,572. Electric Heater. C. S. Steward, Chattanooga, Tenn. Has concentric heating elements.

1,104,577. Electrical Receptacle. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. Inwardly-projecting spring-pressed studs engage threads of plug.

1,104,586. Electrically Operated Brake. G. R. Wadsworth, assignor to The Peerless Motor Car Co., Cleveland, O. A reversible motor operates brake.

1,104,605. Telephone System for Trains. H. E. Barber and J. W. McFarland, Cherry Tree, Pa. A folding pole designed to make contact with telephone wires when erected, but normally kept in engine cab.

1,104,610. Receiver for Telephones. G. N. Blanchard and O. G. Minzenmayer, San Francisco, Cal. Covers details of construction.

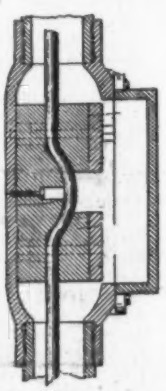
1,104,620. Re-forming of Films of Electrolytic Lightning Arresters. J. W. Brown, Brooklyn, N. Y. A separate circuit is used to charge cells.

1,104,646. Electrolytic Apparatus. J. D. Fields, Butte, Mont. Tank and its subdivisions form anodes of battery.

1,104,660. Combined Insulating and Fastening Means for Rails. W. R. Gorrell, assignor to Gorrell Steel Spike Lock Railroad Tie Corporation, Havre de Grace, Md. An insulating plate surrounds web of rail.

1,104,692. Distributing Switch Mechanism for Electric Signs and Similar Devices. L. Miller, assignor to B. S. Boysen, Brownwood, Tex. Covers arrangement of flashers and switches.

1,104,695. Thermostatic Circuit Closer. J. C. Moessner, Mount Pleasant, S. C. A thermostat operates contact lever.



1,104,395.—Suspension Box.

1,104,709. Switchboard Mounting. A. W. Schramm, assignor to Electro Dental Mfg. Co., Philadelphia, Pa. Resistance pivoted to back of frame.

1,104,712. Wireless Telegraph or Telephone System. W. H. Shephard and A. E. McKechnie, London, England. Includes device to indicate inoperative condition of apparatus.

1,104,715. Dynamo-Electric Machine. S. Sparrow, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Covers details of winding for induction motors.

1,104,720. Electrical Connection. B. B. Turner, Baltimore, Md. A plug and socket.

1,104,733. Distribution of Electrical Energy. P. V. Hunter, Heaton, Newcastle-upon-Tyne, England. Reactances of high positive temperature coefficient inserted between machines operating in parallel.

1,104,734. Burglar Alarm. C. F. Lee, assignor to W. L. Rohrer, Chicago, Ill. A keeper plate for burglar-alarm system.

1,104,737. Electrical Switch. F. Schneider, assignor to The Van Dorn Electric Tool Co., Cleveland, O. An oscillatory switch.

1,104,746. Wireless Telegraph or Telephone System. W. H. Shephard and A. E. McKechnie, London, England. A circuit closer of the rotating type.

1,104,753. Testing Instrument. H. Baluss, assignor to American Steel & Wire Co., Hoboken, N. J. A rail-bond tester.

1,104,754. Electrolytic Cell. J. B. Burdett, assignor to Davis-Bournonville Co., New York, N. Y., and Chicago, Ill. Covers details of electrode arrangements and construction.

1,104,758. Electric Starter for Motors, Alternating or Direct Current. C. B. Pinkerton and A. E. Wason, London, England. Main switch and starting switch mechanically connected.

Reissue 13,776. Original No. 956,484, dated April 26, 1910. Telephone-Exchange System. E. E. Clement, assignor to Telephone Improvement Co., Attica, N. Y. Covers switchboard details.

Reissue 13,777. Original No. 1,074,841, dated October 7, 1912. Electric Locomotive. J. Le Conte Davis, deceased, Pittsburgh, Pa., by Westinghouse Electric & Mfg. Co. A three-section frame for locomotive, the middle section being a magnetized frame.

Reissue 13,779. Original No. 1,038,910, dated September 17, 1912. Relay for Undulatory Currents. R. von Lieben, deceased, by E. von Lieben, administrator, and Eugen Reisz, assignors to The Firm of Relais-Gesellschaft M. B. H., Vienna, Austria-Hungary. A vacuum tube relay.

Patents Expired.

The following United States electrical patents expired July 27, 1914.

586,986. Electric Arc-Light Reflector. C. M. Bolles, Dallas, Tex.

586,993. Telephone System. G. Dilberg and P. Rabbidge, Sydney, New South Wales.

586,995. Form for Winding Coils for Dynamo-Electric Machines. H. Geisenhoner, Schenectady, N. Y.

587,002. Electrically Operated Locking Device for Elevators. T. W. Jenkins, Philadelphia, Pa.

587,004. Telephone Exchange. M. G. Kellogg, Chicago, Ill.

587,013. Telautograph. L. O. McPherson, Highland Park, Ill.

587,015. Electric Meter. G. F. Packard, Fort Wayne, N. Y.

587,027. Lamp Socket. H. C. Wirt, Schenectady, N. Y.

587,062. Electric Bell. J. T. O'Brien, Bridgeport, Conn.

587,080. Calling Appliance for Telephone Switchboards. F. R. McBerty, Downer's Grove, Ill.

587,081. Telephone - Exchange Apparatus. F. R. McBerty.

587,114. Electric Condenser. C. S. Bradley, Avon, N. Y.

587,119 and 587,120. Telephony. J. W. Gibboney, Lynn, Mass.

587,163. Multipolar Dynamo-Electric Machine. S. W. Rushmore, Brooklyn, N. Y.

587,164. Dynamo-Electric Machine. S. W. Rushmore.

587,182. Electric Furnace. G. De Chalmot, Leaksville, N. C.

587,204. Switchboard Annuciator. N. H. Holland, Montreal, Canada.

587,217. Fuse-Holder and Electric Cutout. H. A. Lewis, Norristown, Pa.

587,226. Telephone Trunk-Circuit. J. J. O'Connell, Chicago, Ill.

587,260. Circuit - Closer. S. C. Houghton, San Francisco, Cal.

587,273. Insulator. H. Rudolf, Berlin, Germany.

Electric Vehicle Section

The Electric Vehicle.

[A report of the Committee on Electric Vehicles of the Ohio Electric Light Association, presented at the twentieth annual convention, held at Cedar Point, Ohio, July 21-24. The committee, composed of Mathias Turner, chairman, W. J. Marshall, W. A. Walls, T. F. Kelley, and L. O. Veser, extends its thanks to R. H. Wright, of Cleveland, for the time he has devoted to collecting reliable information and sifting the large amount of information obtained in the compiling of the report.]

The Electric Vehicle.

Before entering into discussion of the electric vehicle of today, it may be interesting to glance at the history of this means of horseless transportation.

As far as we have been able to determine, the electric vehicle on roads was first attempted in France and England, in 1887. In 1894, Jeantand, a Frenchman, manufactured commercial electrics, one of which took part in the races at the Paris Bordeaux, covering some 600 Kilometers (375 miles) of the race by frequent recharging. During 1895, two electric storage battery vehicles competed with a gasoline car built by Charles E. Duryea, in a trip around Chicago. The electrics were built by a Philadelphia battery company to help in developing the business. They made a creditable showing and in 1896, one of the leading motor car concerns of that time gave out the statement that it had passed the gasoline stage and after several years of experimenting had settled on the electric storage battery as the best means of furnishing energy for propelling horseless vehicles. Electric cabs were put on the streets of New York in 1899 and, though crude and cumbersome, they worked for 10 years. At this time, a number of companies were organized for the manufacture of electric vehicles, but the vehicles did not live up to the expectations of their promoters. The rapid development of the gasoline car so far overshadowed the electric that during 1900-1904 there was a decided decline in popular interest. By this time the promoter had come to earth—companies had been reorganized and manufacture started on a more rational basis, until in 1913 it represented a production of 5,000 passenger and 1,448 commercial cars of a type which will fulfill the guarantees placed on them and give the service required. According to the most reliable figures obtainable, there are today 7,085 commercial electric vehicles in use in this country.

It will probably be of interest to discuss one of the earliest types of pleasure cars made. This car was driven by Mrs. Thomas A. Edison. There is certainly a great contrast between it and the latest electric, with its beautiful body and luxurious refinements. In place of the crude old piano box body, with its little cramped-up seat, the modern electric coupe is a drawing room on wheels. Every detail is designed for the greatest comfort and luxury. Rich, imported upholsteries, cut glass lamps and flower vase, complete novelty toilet set, and an imported Swiss eight-day clock, are only a few of the appointments to be found in such cars.

The present commercial electric truck needs no further development before taking its place as a highly efficient, economical means of city transportation. It is today doing this. A survey of the number of large installations of the size and character shown in everyday service, should be convincing.

Successfully filling the demand for a high-class pleasure and a reliable commercial vehicle has not been the only direction in which the electric has made progress. There are already a number of special applications; among which the tractor seems to have made a permanent place for itself.

Development of electric trucks for special features of central-station work has advanced considerably. Companies using this equipment report that it is far superior to anything heretofore available for such work.

At this point, it is believed that mention should be made of the industrial electric truck which is taking the place of hand-pushed trucks for moving baggage, freight, manufactured products, etc.

The extent to which this type of electric truck is likely to be used is indicated by the size of several installations already working, such as that of the Detroit River Terminal Company, who operate 10 in Detroit; the Lehigh Valley Railway, which operates 50 at Buffalo; the Grand Central Terminal Company and American Express Company, who operate together 40 in New York City, and many others.

The mere ability of the manufacturer to produce an efficient electric vehicle, of pleasing appearance, has not been sufficient to satisfy central stations that it has become an unlimited commercial success nor to justify them in unreservedly endorsing it to their customers for all purposes. With more thorough experience has come the conviction that within its proper sphere of operation the electric truck as today constituted is highly efficient, but that outside of that sphere it is not as economical as other forms of horseless transportation. Some of the early experience has also been misleading, influenced by lack of knowledge, by improper use of the truck, by early failures of electric trucks to make good. But with the truck as highly perfected as it is today and the storage battery so greatly improved, the confidence of central stations in electricity as a means of transportation is being very fully restored. The wide actual use of electric trucks by express companies and other large users of transportation vehicles is also an object lesson which can not be ignored. The following schedule of figures is illuminating:

These six cities alone have some 4,932 pleasure and 2,810 commercial electric vehicles, and it is safe to say they represent varied conditions of wealth, topography and paving. It will possibly be of more interest if we analyze the conditions existing in a few of our Ohio cities.

	Passenger.	Commercial.	Total.
New York has approximately	498	1,700	2,198
Chicago has approximately	2,500	636	3,136
Denver, Colo., has approximately	850	65	915
Washington has approximately	775	270	1,045
Hartford, Conn., has approximately	300	50	350
Baltimore, Md., has approximately	19	89	108

A glance at Table A will readily indicate the inequality of development and the members can either compliment themselves on their comparative success, or figure out the cause of the comparative failure.

Probably the thought uppermost in the minds of those who have made only a fair showing in this line of effort is that their time and energies have been directed toward obtaining a more profitable class of business. The amount of revenue to be derived from the charging of commercial and pleasure vehicles is an important question. This it is impossible to state absolutely, but a fair estimate, made by averaging a number of cases, rates the pleasure car as a consumer of 104 units per month and the two-ton commercial car, of 500 units per month. This has been expressed in units so that it may be easily applied to any local conditions.

TABLE "A."

	Population 1910 Cen.	Pleasure.	Truck.	Miles Pav'd Street.	Miles Unp'd Street.	Top.	Cur. Rates.	Elec. Garages.
Cincinnati	363,591	300	65	608	300	Ext. Hilly		
Cleveland	560,663	2000	95	495	327	F. Level	5c	Sl. Scale
Columbus	181,511	450	8	234	100	F. Level	4c	Sl. Scale
Toledo	168,497	500	16	207	193	F. Level	5c	Sl. Scale
Dayton	116,577	225	25	72	223	F. Level	6.6c	Sl. Scale
Youngstown	79,066	125	7	88	161	Hilly	6c	Sl. Scale
Akron	69,067	210	6	81	86	Hilly	5 to 2.5c	
Bucyrus	8,122	None	1	13	10	Level	10c	None

A survey of the business firms, their present transportation facilities, wealth of population, topographical and road conditions of the community served by the central station, will furnish some idea of the possible business in any given territory. It is then up to the central station to determine the amount of money it is willing to spend to obtain this business. This is undoubtedly a local problem and each decision must be based on the merits of the case in question. Having reached this position and determined the approximate amount which is to be expended, whether it be in dollars or a portion of an employee's time, the next thing is a plan of procedure for the central station interested in developing the electric vehicle business.

In making the following suggestions, it is not expected that every central station will see fit to adopt all ideas brought forth; it is only hoped that they will be of assistance to those actively taking up the question.

Some success has been accomplished by the central station taking the agency of some one vehicle manufacturer and directly pushing the sale of electrics; Baltimore, for example. Such a policy undoubtedly has advantages, but these advantages are offset by the fact that it handicaps other manufacturers in obtaining business in that territory. It also means entering a field which is somewhat foreign to that of selling electricity; for example—tire maintenance, battery renewals, general automobile supplies and repair parts. It would seem more advisable, therefore, for the central station to remain neutral as regards the actual make of vehicle sold, leaving the manufacturers, who are presumably the best salesmen of their own product, to fight the sale out amongst themselves, the central station encouraging all to be equally well represented in the territory. This policy should not be carried to the extreme of refusing any assistance or showing any lack of interest, for then an actual loss in opportunities for current sales will result. It is deemed advisable that the central station give this business the same attention it would give a prospective motor purchaser; in other words, have some one man, or group of men, on the lookout for prospective vehicle purchasers, who can furnish to such parties reliable information regarding electric vehicles and put the manufacturer in touch with them. In small towns this duty would fall upon the person who had charge of the new business work. In this connection, the centra-station battery man can often be of assistance in training the local garage men to take care of batteries and assisting the owner in learning how to properly charge his car. Such a practice may mean regular calls by the battery man on the purchaser of a new car for several months, but it is seldom, if ever, necessary to indefinitely continue such service, and it will undobtedly save many failures of electric vehicles which would tend to retard the increase of their use. To accomplish such work, the men doing it must have some training and information at their command. Ohio men can conveniently obtain this by studying vehicles first hand at the factories at Toledo, Cleveland, Detroit or Pontiac by writing the manufacturers for data and catalogs, and by studying the operating cost of the vehicles at present in operation in their cities. Ohio is in an advantageous position as regards battery service, as there are several well-equipped battery depots in Cleveland and the men in charge are always ready to go to any reasonable expense in sending experts over the surrounding territory.

Co-operating with garage men and teaching them to properly take care of electric vehicles is certainly of great importance. If satisfactory arrangements cannot be made in this respect, the central station had better take up the charging and garaging themselves, until such time as the business becomes attractive enough from a money-making standpoint to induce garage men to give it careful attention.

After garaging facilities have been provided, it would be well to look around and see if any electric vehicles have been discarded due to the inability of their owners to have them properly taken care of. These cars should be put in use again if possible to eliminate adverse criticism of the electric, and prevent gas car salesmen from making sales capital of such examples. After existing local problems have been taken care of arrangements should be made with vehicle manufacturers to follow up inquiries obtained by power and light solicitors while doing their regular work. This will doubtless involve preparing lists of firms located in the solicitor's territory and getting a report from him on the transportation facilities of each firm.

"The proof of the pudding is in the eating." The central station should set a good example by using the electric car wherever it is practical to do so.

These suggestions point to positive ways in which business can be developed. There is also a negative way —letting it alone unless arrangements are made to properly care for vehicles after being introduced. Much of the prejudice still existing in people's minds against the electric is due to failure of the first cars put on the market, and these failures can, in most cases, be traced to improper selection of the vehicle for the work required and to lack of intelligent care.

Although the current consumed by electric vehicle averages but 20 per cent of the total cost of operation, this item always looms large in the customer's mind. He is more likely to dwell upon it than upon any other item of expense. It is like coal in the cost of steam power and gasoline in the cost of running a motor. It is, therefore, of prime importance that charging rates should seem moderate, not only in the eyes of the truck buyer, but also in the eyes of the truck salesman. His point of view should be taken as nearly as possible, because he must sell his electric product, in competition with horse-drawn and gas-propelled vehicles, on the score of both

"The Commercial Electric Garage in Los Angeles. One of the many clean well lighted structures operated by General Vehicle Agents. Send for G.V. Literature."
General Vehicle Company, Inc.
Long Island City, New York
New York—Chicago—Boston—Philadelphia

service and economy. Taking the opinion of truck salesmen as a basis on which to determine a proper charge for current to enable the electric to be successfully sold in competition with horse-drawn and gasoline vehicles, it appears that under a rate of five cents per unit the pleasure vehicle business will develop readily, while a rate of three cents is required to do as much for the commercial vehicle.

Work of any association committee is apt to be lost sight of unless it is consistently followed up along specific and practical lines. The members of this committee believe that much local investigation can be profitably carried on in this field and suggest that the personnel of the succeeding committee be composed of central-station men who have direct charge of the electric vehicle end of their business, men who are managing the transportation department, and representatives of the electric vehicle manufacturers, as the next work of the committee should be preparation of the following data covering standard electric vehicles:

1. Price.
2. Mileage.
3. Speed.
4. Sizes and types.
5. Maker.
6. Cost of operation.
7. Charging information.
8. Battery information.
9. Especial applications of electric vehicles.

In connection with this work the Baker Motor Vehicle Company, of Cleveland, has prepared a plan of tabulating such data which, if studied, might furnish valuable suggestions. Also, the Electric Vehicle Association of America doubtless has a great deal of data on file which might be helpful.

We recommend, as a means of gaining information at first hand, that at least one member of the committee visit the principal vehicle manufacturing plants, study the vehicles and service plans of the manufacturers and then visit the central stations, explaining to them both vehicles and service of the committee. This, at first, may appear a rather expensive program, but when we consider that the vehicle men of some central stations have undoubtedly visited many of the factories and will probably include others during the coming year, the first part of the expense is almost eliminated. The second part might be covered by the central station bearing part of the expense of the visiting committee member. The experience gained by the committee member in visiting different central stations would undoubtedly increase his value, compensating his company for time spent away from his work.

ELECTRIC VEHICLE OPERATION AND MAINTENANCE.

By Walter R. Metz.

Motor trucks have their place, and the use of gas or electric depends on conditions, just as does the use of motor trucks over horses.

If a man is willing to plod along slowly, and take what he can get, or if his business is only enough for a single horse, he would not be justified in purchasing motor trucks. On the other hand if he wants long hauls and few stops such as suburban delivery he would certainly be justified in going beyond the electric and purchasing gas cars.

But I am firmly convinced that for city service with road conditions as they now are in most cities and with short hauls and a number of stops, the electric truck has a field of its own that will not be denied.

One of the first things to pay attention to in the operation of trucks is speed. The average person wants to travel fast and get there quickly, but when it is remembered that city service often means stops in each block and that the total standing time of trucks is considerably more than the running time, the speed becomes of less importance. Rather put more men on your trucks and cut down your standing time, than cut down on the labor and try to speed up to make up the lost time.

On the heaviest trucks in my office we use three men and even with these the standing time, as shown by a service recorder, is practically 50 per cent of total time.

A truck, therefore, designed for moderate speed is what is needed and for this service an electric stands preeminent.

The trucks having moderate speed are also easier on the running gear and tires, and here begins the real part of this paper.

Let us consider the truck frame first and its running gear.

As soon as it is brought into the garage it should be examined for loose nuts, bolts, etc. All grease cups should be carefully examined, as should also the chains and sprockets. Lubrication is worth all the attention given it and this point alone may determine the practicability of our electric trucks.

Trucks should not be washed down every night as is done in some places. This only is a waste of energy and tends to decrease the life of the painting, to say nothing of rust on those parts you may have forgotten to oil. Washing down twice a week is sufficient, excepting of course in time of rain and mud. Chains should be removed about once a month and then should be carefully cleaned and just as carefully oiled.

A heavy oil or grease is not good for chains as it will not get into the gearings. A lubricant made up of light cylinder oil mixed with graphite makes a satisfactory lubricant and keeps the chain in good condition.

Tires are often a considerable factor in the expense of running trucks, but they need not be if proper attention is given to sizes, quality, etc.

For example, I have seen tires that were very resilient, so much so in fact, that the rubber flattened out to a great extent, and the truck was using up a great part of its power in pushing ahead the rubber just in front of the actual bearing of the tire on the ground. It had the same effect as running uphill all the time. On the other hand I have seen tires so hard that there was no resilience to speak of and the owner might almost have used a wood or iron bound wheel, as far as relieving the truck from strains was concerned. If a tire has the proper amount of resilience and the proper size is used there should be no trouble in getting 10,000 to 12,000 miles life.

I do not believe that the average owner pays proper attention to the size of his tires, but will accept what is given him by the manufacturer. I have seen a 1,000-pound car of a certain make with two and one-half-inch tires front and rear, even though the rear wheels were carrying over 60 per cent of the load. This is not good practice and will certainly tend to short life.

I should like to see a standard adopted in common by manufacturers and users, based on certain sizes to carry certain weights. The Society of Automobile Engineers has taken a step in the right direction, but should go further, and I believe it will.

The Government is taking up the tire question at the present time and I believe it will specify certain sizes of tires for certain loads in future work.

Charging batteries in cars is a comparatively simple operation but is often done in a slipshod manner. We often see loose ends of cable lying around the floor, and the employee simply picks up one of these, places the plug in the receptacle and goes about his business. When the car is fully charged the cable is thrown on the floor and left there, catching dirt and rubbish and worst of all water.

When I designed our garage, we brought all cables overhead, then dropped the ends down, the free end being long enough to form a loop. To this loop there is attached a counterweight and the cable, when not in

use, is high up and out of the way. When the car is to be charged the garage man pulls the end down with a special hook made for the purpose, and after the car is charged and the plug taken out of the car receptacle, the counterweight raises the cable out of the way. By adopting this method we have been able to keep the floor clear of wires of all kinds and it can be cleaned with a hose without danger of ruining cable.

In our garage each car has a separate charging panel. This may seem unusual and in public garages would probably not be advisable, but the use of individual panels permits us to keep an absolute record of the current used by each car.

The panels are of the Cutler-Hammer make and on each is mounted a volt-ammeter, a double-pole knife-switch, fuses and contact segments by means of which the charging current is regulated.

At the bottom of each panel are mounted protective devices consisting of low current cut out, which automatically opens the circuit if the current drops to a predetermined minimum, a maximum voltage cut-out to automatically open the circuit when the battery voltage reaches the point at which the cut-out is set to operate, a solenoid switch and an overload circuit breaker.

Each panel is numbered, and in the garage proper, a corresponding number is hung directly over the charging cable so that in shifting chauffeurs each one has only to know the number of his car and he can see at a glance the proper station.

We have also recently installed a wheel rack for keeping wheels off the floor. We have found it good practice to keep a spare wheel on hand for each size car, and if these wheels are kept on the floor all the time they are very apt to injure to some extent that part of the tire that bears the weight. This rack is nothing more than a heavy wooden framework with pegs at proper intervals. The wheels are hung on these pegs by the use of a chain block attached to a trolley running on the lower flanges of our overhead I-beam.

The results have proven that we are fully justified in the purchase of spare wheels, for we have never yet been compelled to tie up a car on account of wheel or tire trouble.

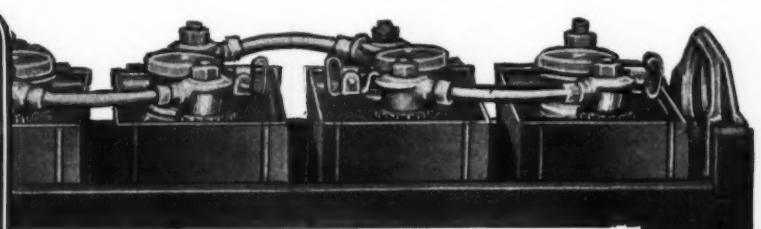
It is well known that removing batteries from the cars is very apt to cause trouble, and to overcome this, I designed a special truck for removing and transporting the batteries without a jar. This truck is used in connection with platforms and is designed to have a height of about one-quarter to one-half an inch less than the height of battery in the car. The truck and platform are run up to the side of the car, the battery slid out on to the platform and a lever in front is then raised from a horizontal to a vertical position, raising the platform and battery about one inch or more off the ground, but still supported by the truck. It is then pulled to the battery room and the lever lowered, thus lowering the battery to the ground without any jar. The truck itself is then hauled from under the platform and used elsewhere. One truck will, of course, handle a number of cars and their batteries.

Care of Batteries.

Probably the most important part of a car is its battery equipment, and the owner of a number of cars will be well repaid if he places competent men in charge to look after this detail.

Our batteries are looked over every night and the results have fully justified the trouble, for we have been running now for two years and seven months on the original batteries, and they are in a very good condition today, apparently good for a long time.

In our garage we aim to give each battery a good overcharge every two weeks, and water the pilot cells just before the overcharge. The batteries do not usually need watering more



18,529 Miles a Year

and Less Than $1 per month Battery Maintenance. From Service Report, Year Ending December, 1913, on Edison Battery—Detroit Electric Police Patrol Wagon operated by City of Memphis, Tenn.

Number of Runs	**5,166**
Number of Miles	**18,529**
Cost of Tires, Chains, Grease, etc	**$275.30**
Cost of Battery Solution (Total Battery Maintenance)	*11.92*
Total Maintenance	**$287.22**

The Edison Alkaline Storage Battery in this kind of Service is guaranteed to be capable of developing **100 per cent** of its rated capacity at the end of **four** years.

Send us the name of your Commissioner of Fire and Police.

Edison Storage Battery Co., 105 Lakeside Ave. ORANGE, N. J.

Chicago Office: 2025 Michigan Avenue

than once in two weeks. Readings are taken immediately after overcharging, and we attempt to equal this reading each night. Readings of both hydrometer and temperature are taken as far as possible every day, the rule being to read twice each night.

A good point to remember in taking hydrometer readings is not to depend upon the first reading. If the hydrometer syringe is used on a certain battery and then on another, there is very apt to be a variation from the true reading of the second cell, but if some of the acid is drawn out and then put back, and drawn out a second or third time the reading will be correct. The reason for this is that some of the acid from the cell first read is apt to adhere to the syringe and it has been found that the first reading is often from five to six points more or less than it should be, when there is a difference between the batteries tested.

Lansden Electrics to be Made in Brooklyn.

Brooklyn is to have an automobile factory in the near future. The Lansden Company, Limited, has leased large factory buildings at Flatbush and Nostrand avenues and will shortly begin the manufacture of Lansden electric cars and trucks.

The company has acquired the entire plant and good will of the old Lansden Company at Newark, N. J. The concern was organized and owned by Thomas A. Edison and was one of the pioneers in the electric commercial vehicle field.

J. B. Wickery is the general manager of the new company, and under his direction new and modern machinery is being installed in the recently acquired factory. It is proposed to manufacture completely at the new factory electric delivery cars and trucks of every description.

A service station for users of the company's output will be installed, as will also a charging station for all electric commercial and pleasure vehicles.

Woods Electric Makes Announcement for 1915.

The Woods Motor Vehicle Company, Chicago, Ill., has prepared a preliminary announcement respecting its 1915 electric models. The literature which has been prepared shows exterior and interior views of Model 1501, five-passenger brougham, worm gear, dual control; Model 1503, five-passenger broughan, worm gear, front control; Model 1504, five-passenger brougham, worm gear, rear control; Model 1522, four-passenger brougham, worm gear, rear drive. A very interesting type is the Model No. 1330, which is a three-passenger roadster with a bevel gear and shaft drive.

THE ELECTRIC COMMERCIAL VEHICLE VS. THE HORSE.

By Charles A. Ward.

There are doubtless none of you who have not at one time or another been visited by that pest or godsend, as the case may be—the electric vehicle salesman, and of whom you have asked after much talk—to you, that final and all important question—"Why an electric?"

You have been told in reply that electrics are durable, reliable and economical. True! electrics are durable; no one will dispute the fact, for scores of electrics still run in regular service that were installed more than ten years ago, while many, many more could be run were it not for the fact that the more efficient machines of later years make it more profitable to lay aside the earlier type because of the greatly increased earning capacity of the present vehicle. Certainly then you believe them durable and let me add this one word for those whose belief still borders on that of skepticism, that an electric will last as long as the owner will provide it with necessary running repairs.

But you say, and rightly so, are electrics reliable?

Before going further, what is reliability? Reliability, we are told, is that element in any piece of apparatus that makes it possible to depend upon that apparatus for the performing of its various functions a high percentage of the time at which such demands are actually made of it.

Is the electric reliable? Almost without exception owners of electrics will tell you that they are, and the writer has personal knowledge of a reliability factor as high as 98½ per cent in a very large installation and during the winter period of the year. There are many, many cases of electrics in commercial service that have operated for months at a time with nothing more than a charge, an occasional oiling and some adjustments. The best answer to such a question is always found with those firms whose very prosperity and life depend upon the regular and prompt delivery of their merchandise, and the express companies, baking companies and department stores are only some of the more important examples.

You have been assured then of the durability and the reliability of the electric. But how about their economy? For you say, and justly so, that even though electrics are both durable and reliable, I cannot afford to buy, much less use them, unless they will enable me to reduce my delivery expense. And let me emphasize for you this last factor by making this broad and comprehensive statement; namely, that you not only cannot afford to use electrics unless they will reduce your delivery expense, but you have no right or business to use them unless that use means a real economy to you and something that can be measured in dollars and cents.

Let us see then whether or not this last acid test can be given with safety to the electric vehicle and whether it will withstand this test under every condition of use, for if it does, you will be obliged to reach this conclusion; namely, that the best time to sell your horses is now while the market is good, and the best time to buy electrics is now, so that you may the sooner read the saving in delivery expense that is in store for you.

Before passing to the next division of the paper, let me say that the value of the electric vehicle from an advertising standpoint will not be considered as an asset although there is undoubtedly a very good advantage in their use in this respect in such lines of business as those of caterers, bakers, butchers, and in fact any business involving the handling or haulage of foodstuffs.

In the cost comparisons which I hope to show later, let me say that in the cases of both the electric vehicle and the horse wagon every item of expense has been considered except operator's wages. This has been omitted for the reason that in each case here analyzed this item has been considered

TABLE I—ELECTRIC VEHICLE EXPENSE.

Comparative Cost Statement Between Electric Motor Wagons at Plants "A" and "B."		
Labor	$21,776.51	$20,710.32
Batteries and Supplies	8,734.81	8,369.23
Repairs	14,428.08	19,884.62
Insurance	7,650.00	8,222.16
Taxes	272.53	322.53
6% interest on investment	14,008.20	14,587.77
Depreciation (buildings 1%, automobiles)	18,664.29	18,680.53
Power (estimated) 1.5 cents per kilowatt hour	6,739.20	7,300.80
	$92,273.62	$98,077.96
Average number autos	121	130
Average number routes	101	103
Average number autos per route	1,198	1,262
Average cost per route per year	$ 913.60	$ 952.21
Investment—Land	16,736.44	17,209.54
Investment—Buildings	34,017.17	37,287.17
Investment—Automobile	182,716.47	188,632.75
	$233,470.08	$243,129.46
Average investment per route per year	$ 2,310.59	$ 2,360.48

Books on Electric Vehicles

Textbook on Motor Car Engineering

By A. G. CLARK.

To be complete in two volumes. Vol I., Construction. 213 illustrations. 6x8¾. Cloth. 457 pp. Price, $3.00.

Contents: General Principles and Construction of the Petrol Engine; Details of Engine Construction; Petrol and Other Fuels; Carbureters and Carburation; Thermodynamics of the Petrol Engine; Horse Power; Mechanical, Thermal and Combustion Efficiencies; Principles and Construction of Coil and Accumulator Ignition; Magneto Ignition; Engine Control and Cooling Systems; Crank Effort Diagrams; Clutches and Brakes; Gears, Lubricants, Lubrication Ball and Roller Bearings; Chassis Construction; General Principles of the Steam Car; Steam Engines and Condensers; Steam Generators and Pipe Diagrams; The Electric Car; Materials Used in Motor Car Construction; Examination Papers; Physical Properties of Petrol; Mathematical Tables and Constants.

The Automobile Hand-Book

By L. ELLIOTT BROOKES, Assisted by Other Well-Known Experts

Revised and Enlarged 1911 Edition. 16mo, over 650 Pages and over 320 Illustrations. Full Leather Limp, Round Corners, Red Edges. Price $2.00.

The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 320 illustrations.

Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analysed and compared.

The perusal of this work for a few minutes when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car, with regard to its going qualities on the road, when properly and intelligently cared for.

This is a brand new book from cover to cover—1911 Edition—and must not be confounded with any former editions of this popular work.

PRACTICAL AUTOMOBILE DICTIONARY. By S. KRAUSZ

English-French-German; French-English-German; German-French-English. With an introduction by C. J. Glidden. Twelve thousand technical terms and other words employed in connection with motor cars and motoring. For use in office, factory, repair shop and touring in foreign countries. 16mo. Leather. 129 pp. Price $2.00.

SELF-PROPELLED VEHICLES. By JAMES E. HOMANS

A practical treatise on the theory, construction, operation, care, and management of all forms of automobiles. Seventh Edition, revised. 500 illustrations. 6x9. Cloth. 607 pp. Price $2.00.

The various theories and problems involved in the construction and operation of the prevailing types of motor road carriages have been stated as clearly as possible, in order that the involved situations may be readily comprehended by all readers. The fundamental principles of the several types of motor, particularly of the gasoline engine, which is the least understood of all, have been treated at considerable length, in order that the facts may be thoroughly comprehended in their new relations.

THE AUTOMOBILE. By P. N. HASLUCK

A practical treatise on the construction of modern motor-cars, steam, petrol, electric and petrol-electric. Three volumes. Special Edition, enlarged. 1,200 illustrations. 8vo. Cloth. 1,300 pp. Price $10.00.

A very handsome set of instructive books brought up to date in the third volume containing many elaborate illustrations of cars now in use.

Electrical Review and Western Electrician

Western Headquarters for Electrical Books

608 S. Dearborn St.
CHICAGO

Gould Storage Battery

A LEADING firm of lumber dealers in New York City who bought their first Gould Vehicle Battery with a view to economy in transportation costs recently wrote us as follows:

"Yesterday we sent you an order for a new Gould Battery to replace the one still in service on our two-ton truck.

"I take this opportunity of thanking you for the service you gave us on this last battery. Your contract only called for one year, but the battery has seen 19 months' service and has been on the road every working day. This battery was not laid up one day in that time and we can figure on getting enough mileage for the next 30 days. At that time we will install the new battery. This record is a great credit to the Gould Storage Battery Co. We know of no other battery that would give such service."

60 per cent more service than we promised has made this company a firm believer in the merits of the Gould Battery.

The above performance typically illustrates our conservative policy in rating and in making claims for reliability, durability and general service satisfaction.

Tell us make, model and present mileage of your car if you want quotation on a Gould Battery and advise as to the service improvement possible.

Gould battery renewals fit jars of any make.

Ask for our booklet "What Gould Vehicle Batteries Are Doing."

Gould Storage Battery Co.

GENERAL OFFICES: 30 E. 42nd ST., NEW YORK CITY
WORKS: DEPEW, NEW YORK

BOSTON: 14-16 Cambria St.
PHILADELPHIA: 613 Betz Bldg.
CLEVELAND: 1761-5 E. 18th St.
DETROIT: 88 E. Congress St.
CHICAGO: 225 E. 22nd St.
SAN FRANCISCO: 1448 Van Ness Ave.
LOS ANGELES: 110 E. Pico St.

Agents in: Washington, Rochester, Buffalo, Pittsburgh, Milwaukee, Minneapolis, St. Louis, Kansas City, Omaha, Denver, Topeka, Seattle.

Canadian Representative: R. E. T. PRINGLE
Toronto Montreal Winnipeg Vancouver

107

as a selling and not a delivery expense.

First then, what does it cost to operate electric vehicles? Let me answer this question by showing you in Table No. 1 the complete costs of two large fleets of electrics; the average of which has been taken over a period of more than two years and where, as I said before, every item of expense has been considered except operator's wages.

To get quickly to the roots of the matter, you will note under plant "A" that the cost per route per year is $913.60, while in plant "B" the cost is $952.21. An average of these two figures shows $932.95 as the cost per route per year covering the electrics in question.

Let me now show you Table No. 2 whereon is shown the operating costs for horse vehicle routes in a similar line of business and in cities extending from New England to the Middle West.

If you will note again the cost per route per year you will find these figures varying all the way from $1,060.80 to $1,337.65 per route per year for the horse vehicle equipment. If again we average the five sets of figures in question here we will obtain $1,210.45 as the cost per route per year covering horse vehicle operation, or an average saving of $277.30 in favor of electrics.

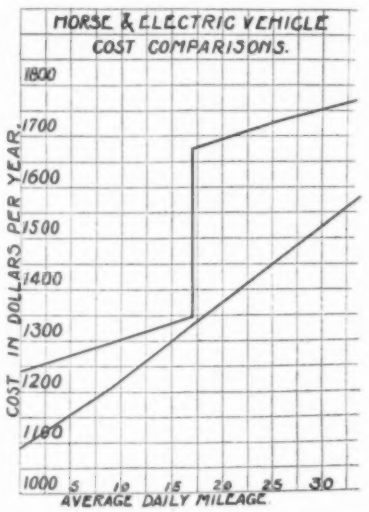
If for the moment we return to plant "A," Table No. 1, where they operate 101 electric routes this means an actual annual saving of 101 times $277.30, or $28,007.30 in delivery expense to say nothing of a cleaner delivery method.

There must be something wrong you say; such figures are amazing, they cannot be right. Let us see.

In the first place let me state that the average mileage for the electrics given in Table 1 is practically 25 miles per day for each route, while the average length of the horse route in Table II is just about the same.

Secondly, you will note that the average number of horses per route varies from 2 in plant "E" to 2.5 in plant "D."

A lot of useless spares you will say, eating their heads off and not doing any work. No they are not, for it takes two horses to every single horse wagon, the average daily mileage of which is 25 miles; and more than this where the routes are hilly or the roads bad. Expert horsemen will tell you, and tests I have made have shown, that a single horse in a single horse wagon cannot average more than 17 miles per day without undue depreciation, either physically or commercially. Two horses in a single horse wagon can average daily not more than 25 miles under similar conditions.



Sheet 3—Horse and Electric Vehicle Comparison.

But you say, "my routes are short. I only average a little more than one horse to a single horse wagon and my horses are in the pink of condition. Electrics would be of no value to me. I could not make them pay."

Just here let me make this very important statement and one which I will attempt later to prove; namely, that "a single electric against a single horse wagon can do the same work for less money *regardless* of the mileage."

I have shown you beyond contradiction, I believe, that the electric had the horse beaten on routes averaging 25 miles or more. Did you ever stop to think what horse expense stopped when the horse did no work but merely stood in the stable? He eats almost as much when idle as when working. He requires nearly as much care. Interest, depreciation, taxes, insurance, shoe and veterinary bills go on just the same. In fact it costs you very nearly as much whether he works or not. Think now what happens when an electric stands idle. Repairs to mechanism disappear at once. No care is needed, no current is necessary for charging and only slight depreciation appears in tires and battery to such an extent that it is actually cheaper to keep a single electric standing than it is a single horse and wagon. This is nicely brought out in the curve shown on sheet No. 3, where the comparison in cost in dollars per year is shown between the electric and the horse for various numbers of average miles per day from 0 to 34. You will note that when both electric and horse are idle there is shown a saving per unit of nearly $140 per year. This saving gradually decreases when both are used up to a point at which the horse is doing his limit of 17 miles per day when suddenly the curve shoots up to nearly $350 per year as a saving as soon as the 17-mile limit is exceeded. From this point on to 34 miles per day where both horses are working their full limit there is then shown a saving of approximately $200 per route per year in favor of the electric.

If then, we draw a line between the two extreme points of the horse-drawn vehicle curve and a point P bisecting line 5.5′ we will have a fairly accurate representation of the horse vehicle cost curve for various average daily mileage.

I would also like to have you note that were we to continue both horse-vehicle curve and electric-vehicle curve to the left and past the zero point they would apparently meet at negative values for both "cost in dollars per route per year" and "average daily mileage," or in other words, the cost for horse delivery and electric vehicle delivery is the same, *only* under imaginary or impossible conditions.

An amplification of this analysis, with a reproduction of the comparison chart, and another table, will be published in the next issue.

TABLE II.—HORSE VEHICLE EXPENSE.

Comparative Cost Statement Between Horses at Plants "C," "D," "E," "F" and "G."

	Plant "C"	Plant "D"	Plant "E"	Plant "F"	Plant "G"
Horse expense	$ 2,668.38	$ 3,608.57	$ 4,106.60	$ 3,984.91	$ 6,912.88
Wagon expense	2,172.07	3,861.56	5,473.40	501.26	7,287.27
Harness expense	542.54	720.91	1,504.70	470.20	952.98
Stable labor	4,168.63	8,443.94	5,916.26	5,892.42	9,783.05
Feed	8,462.45	13,127.41	15,606.33	13,577.72	17,137.78
Stable sundries	1,049.45	1,873.81	1,889.78	1,176.13	2,444.29
Depreciation (10% on wagon and harness) (1% on land and buildings)	919.98	1,462.38	1,396.90	1,557.97	1,405.22
Taxes	717.96	868.99	1,512.98	1,613.26	711.00
Insurance	102.26	117.08	120.27	237.07	470.00
6% interest on investment	2,772.71	3,926.24	3,661.71	5,768.02	1,692.15
Total Expenses	$23,576.77	$38,010.89	$41,188.93	$34,778.96	$48,796.62
Average number wagons	28	32	44	25	75
Average number horses	47	80	64	63	96
Average number horse-wagon routes	20	32	32	26	46
Average number horses per route	235	2.5	2	2.423	2.087
Average cost per route per year	$ 1,178.84	$ 1,187.84	$ 1,287.15	$ 1,337.65	$ 1,060.80
Average investment per route per year	2,310.60	2,044.92	1,907.14	3,697.45	613.10
Investment—					
Horses, wagons and harness	25,560.89	24,014.31	17,628.86	21,157.99	27,350.68
Land and buildings (est.)	20,651.01	41,423.07	43,409.58	74,975.66	851.82
Total investment	$46,211.90	$65,437.38	$61,038.44	$96,133.65	$28,202.50